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EDITORIAL

Leaders Will Pass, But Their Work Must Continue

In recent months, death has taken two valued and influential leaders from the ranks of pioneer foresters,—James William Toumey and William Willard Ashe. Though they pursued different specialties, there are some significant parallelisms in their traits of character and work which are worthy of emulation. The contributions of both were fundamental, substantial, and abundant. Both were drawn toward forestry from the broad field of botany. Ashe continued with botany as a hobby; Toumey made it the basis of his research in silviculture. (Some day the fact that botany furnished many of America's first foresters must be made the subject of a critical appreciation. It was an important coincidence. Foresters of today are drifting too far away from botany). Both were modest men, more intent on gaining knowledge and quietly putting it to use than on posing as authorities for their own aggrandizement. Both were of the research type of mind, albeit intensely practical. Their investigations were not haphazard but directed toward the solution of problems they met in the course of their practice and experience. Both were students always and assiduous in the search for facts and their uncolored interpretation. Both made friends and admirers on the basis of their manly qualities and genuine accomplishment.

Professor Toumey's greatest contribution was made as a teacher, although his versatility led him also to serve well otherwise. He pioneered the teaching of American dendrology, wood technology and silviculture. In dendrology his first-hand knowledge and his ability to make every tree have some individuality excited interest and helped the student remember essential characteristics. In silviculture, his specialty, he again had the advantage of actual experience in its practice. This, combined with his thorough knowledge of the literature of the subject, and his engaging style made his courses most fascinating. Never wavering in his faith in the future of forestry he inspired in his students a like faith. His interest and pleasure were centered in the teaching of young men. His thorough knowledge, friendly interest, simplicity and utter lack of pretense won him the respect and love of all. He was a great teacher, and that he most wanted to be.

Mr. Ashe is best known among foresters for his pioneer work in the costs of logging and milling timber of different sizes and

his uncanny knowledge of timber values. Among botanists he was rated a leading authority on the southeastern flora. His botanical background helped him to contribute much to the silviculture of the southern timber region. Ashe had those rare but essential attributes—quick perception and keen and understanding observation. They gave him the originality for which he was noted among his associates. With a natural aptitude for research, he was however repeatedly deflected from it by administrative exigencies, but he found time to do much writing and to share his experience and knowledge with others. He was a thorough worker of whom one admirer wrote "whenever he published anything, the reader could be sure of getting some real information on the subject discussed." With so many technical men today eager to become authors this tribute is worthy of their consideration.

The death of these pioneer foresters serves to remind us that our profession has had splendid examples of thorough, painstaking, honest building which those of us who must carry on will do well to emulate. Only such work will endure.

American forestry, although only a little more than thirty years old, and therefore still a young profession has already reached the time at which it must accustom itself to the loss of leaders through death. It is exceedingly fortunate that its far-visioned founders saw not only the need for the saner management of our timbered lands but that they were able to inoculate younger men with their ideas and ideals so that the work might continue after they were gone. Is there another profession of comparable age that was launched under such adverse circumstances but which became so quickly and firmly established and accepted in the public's confidence as forestry? Our leaders, first of all, loved the forest, while their training in the sciences made them cognizant and heedful of the natural laws that gave it life and substance. They knew that a violation of these laws would ultimately bring distress to the Nation. They made it their business to serve the public in seeking correction of the abuses then current. Forestry was new but they had the real spirit of the pioneer—thoughtful of those who were to come after. They knew that if their work was to endure it must be built on firm foundations. Where they were in doubt they made it their business to investigate and find out for themselves. No traditions, no beaten paths were available. European experience and practice were useful only in part. Our problems were different and vastly larger and more complicated, if not as acute. Our founders had to build from the start, and they had much to do, but their contagious enthusiasm attracted others and brought them help. In this day of doubt and of charlatanism we can ill afford to lose any of such genuine leaders. We need their inspiration and guidance now as much as ever. We must carry their work forward and without lapse of their enthusiasm and faith.

JAMES WILLIAM TOUMEY

By HENRY S. GRAVES

Dean, Yale School of Forestry, New Haven, Conn.

JAMES WILLIAM TOUMEY, D.Sc., D.For., Professor of Silviculture at the Yale School of Forestry, died at his home in New Haven on May 6, 1932. He was one of the early pioneers in forestry, a distinguished educator, and a scientist of wide reputation and influence. His early training was in botany, and he had already gained distinction in that field when in 1899 he entered the government service to organize and direct the work of tree planting. Almost at once he took a prominent place in the forestry movement and throughout his career was in the foremost ranks of the leaders of the profession.

In 1900 he was called to Yale as a member of the faculty of the newly established school of forestry. His training as a scientist, his experience as a teacher and investigator at Michigan State College and the University of Arizona, and his familiarity with forest conditions in different parts of the country, furnished an unusual background for his educational work at Yale. During the first years he was obliged to teach a variety of subjects, but he centered his chief efforts in the field of forest production. His contribution to the development of the Yale School of Forestry cannot be over-estimated. He was a great teacher. He was a powerful factor in establishing and maintaining high standards of scholarship. By his scientific research he added to the prestige of the institution and aided in making it a center for advanced graduate study. For thirty-two years he was in continuous service of the school. Every student who attended the institution came into close association with him.

Professor Toumey possessed unusual qualifications as a teacher. He had an exceptional foundation of science and he acquired by research and practical experience a knowledge of forestry which commanded the respect of his students and of his colleagues as well. He had a deep interest in teaching and in students, and he devoted himself without stint to those working under his guidance. He had the ability to present his subject clearly and with emphasis on essentials. His unflagging enthusiasm was an inspiration to all who worked with him. He stimulated his students to individual effort, which is the chief essential in education.

Professor Toumey was a scholar, but also a man of action. He perceived the need of basic knowledge that could be acquired only by research and experiment. He emphasized equally the necessity to apply in practice the knowledge which we already possess. He was a teacher of silviculture but was also a successful practitioner. He constantly sought to make his experimental and practical work count in laying sound foundations for practice.

As the years went by he delved deeper in the scientific reasons for the phenomena which he observed. Ever curious to search beyond the areas of known facts, alert to discover new manifestations of nature, never hesitant to depart from precedents in research, ingenious in devising new methods of procedure, patient and persistent in his studies, keen in the interpretation of his findings, he demonstrated the qualities of the true investigator.

Professor Toumey did not by any means confine his activities to academic work. He interested himself in local and national problems of forestry. Many a woodland tract and plantation, privately owned, bears

JAMES WILLIAM TOUMEY
1865-1932

the stamp of his skill as a forester. His writings testify to his broad interest in forest management, economics and policy. His influence was felt at forestry meetings and, more widely, through his public addresses. He utilized the Yale Forest, at Keene, New Hampshire, not only for research and experimentation, but also as a practical demonstration of forestry in public education.

Professor Toumey possessed a dynamic personality. He was a man of strong convictions and always frank and courageous in expressing them. He had unfaltering faith in forestry and confidence in its future. He was a man of vision but was by no means a visionary. He clearly recognized the practical limitations of forestry as applied under present conditions. Economics and common sense guided his silviculture.

He was a man of intense devotion to whatever work he undertook. His kindliness and generosity won the regard of all those who came in contact with him. His death is a loss to the profession and to the cause of forestry; it is a personal loss to a host of friends who held for him a deep admiration and affection.

Professor Toumey was born in Lawrence, Michigan, April 17, 1865. His youth was spent on a farm, and his early educational work was in the local schools. He prepared for college at the Decatur High School, but taught school for several years before entering the Michigan State Agricultural College, from which he graduated in 1889. In college he directed his chief efforts to the study of Botany. His work was given recognition by an appointment as an instructor in the College in 1890, and by the degree of Master of Science in 1893.

In 1891 he was called to the University of Arizona where he remained until 1898, advancing by steps to a full professorship in Botany. At the same time he held the position of Botanist in the State Agricultural Experiment Station, under whose auspices he conducted his scientific research. He served as the Acting Director of the Station in 1897-1898. During this period he made very distinctive contributions to plant science. He conducted investigations in the fields of taxonomy, ecology, physiology, and pathology, and also in entomology. He did special work on the date palm and became widely recognized as an authority on cacti. He established a cactus garden at Tucson which has been continued by his successors. He built up a large cactus herbarium, drawing upon it to aid the plant collections of Kew and other institutions. In 1897 he visited England and personally assisted in the systematic arrangement of the collection at Kew. About twenty-five articles and bulletins remain as a record of his investigative work in Arizona.

Mr. Toumey began his formal work in forestry in 1899 when he was appointed Superintendent of Tree Planting in the Division of Forestry, United States Department of Agriculture. He was selected for the post because of his knowledge of trees and in recognition of the experimental work which he had already done in tree planting. His duties were to encourage reforestation and to coöperate with private owners. He traveled extensively, studying local problems in various regions and assisting individuals by direct advice and through numerous publications.

When the Yale Forest School was established in 1900 Professor Toumey was chosen as one of the two regular members of the staff. Forestry was new and untried in this country, and there was little instructional material applicable to American conditions. It was a period of building the first foundations both of forest education and of the science and practice of American forestry. In this work Yale played a prominent part and Professor Toumey's contribution was large.

When the Dean of the School, Henry S. Graves, was called to Washington to take charge of the United States Forest Service

in 1910, Professor Toumey succeeded him as head of the School, a post which he held until 1922. During this period he materially enlarged the endowments and the physical facilities of the School. He was responsible for the gift of the new central building, Sage Hall. He enlarged the forest properties of the institution and secured large accessions to the library. He himself donated a collection of some 2,500 specimens to the forest herbarium. Even more important, he developed and strengthened the educational work, adhering to high scholastic standards and ideals as essential in a professional preparation for forestry.

In 1922 he retired from the deanship and devoted his efforts to teaching and research. The last decade of his life was the richest in his personal contributions to the science of forestry. Many research projects which he had previously initiated were brought to fruition. His approach to forest research was from the standpoint of the solution of the problem encountered in practice. In his extensive operations in the nursery and field planting he had observed many phenomena that required explanation. Empirical knowledge did not suffice. He initiated basic studies in the relationship of soil, light and moisture to the development of seedling growth in the forest and in the plantation. He gave new emphasis to the importance of moisture as a primary governing factor in the struggle of young trees for life. His experiments in this field have attracted wide attention both in this country and abroad.

During the past decade or more he centered his efforts on the development of the Yale Forest at Keene, using it as an experimental ground for his field research. Through his efforts the area of the forest was materially enlarged, open land restocked, improvement cuttings of various kinds carried on, and the whole property brought into a high degree of producti[v]ity. Aided by a good local market for [a] variety of products he was able to make a[n] excellent financial showing of the resul[ts] of intensive forestry.

Each year he conducted a field camp o[n] the forest, with a group of graduate stu-dents who conducted research under his di-rection and aided him in the practica[l] management of the property. He develope[d] a forest of great value as a demonstratio[n] of forestry to land owners and others; h[e] demonstrated also the great value to a for-est school of a property for whose man-agement the institution is responsible, tech-nically and financially. He was able ju[st] before his death to complete a bulletin de-scribing the Yale Forest at Keene, the his-tory of its management, and the results ob-tained. The Keene Forest will stand as a[n] enduring memorial of his work in forestr[y].

Professor Toumey contributed exten-sively to the literature of forestry. Hi[s] *Seeding and Planting* and *Foundations o[f] Silviculture* are standard works widel[y] used as text and reference books by stu-dents in the forest schools and by other[s] interested in forestry.[1] He was responsib[le] for initiating at the School of Forestry [a] series of scientific bulletins, now compri[s]-ing thirty-three numbers. Of these he wa[s] author or co-author of eight, and seve[n] others were written by graduate studen[ts] working under his direction. In additio[n] he wrote extensively for the forestry jour-nals and other periodicals. His bibliogra-phy covers a wide range of subjects, in-cluding articles of a scientific characte[r,] discussions of applied silviculture, fore[st] taxation, watershed protection, forest eco-nomics, and public forest policy.

Professor Toumey was called upon fre-quently for public addresses and for par-ticipation in public enterprises throug[h] committees and advisory boards or as a

[1] *Seeding and Planting.* James William Toumey. John Wiley and Sons, New York. 1916. Revis[ed] by J. W. Toumey and C. F. Korstian, 1931. *Foundations of Silviculture.* James William Toume[y.] John Wiley and Sons, New York. 1928.

ficer in technical and civic associations. n 1929 he was a member of the American elegation to the International Congress of orest Experiment Stations at Stockholm, weden. He was granted the honorary degree of Doctor of Science by Syracuse niversity in 1920 and the honorary degree f Doctor of Forestry by the Michigan tate College in 1927. He was a Fellow of he Society of American Foresters, and a ember of Sigma Xi and of a large number of organizations engaged in advancing the interests of forestry and conservation.

In 1897 Professor Toumey married Miss Constantia Blake of New Haven, who died in 1904, leaving a son, James W. Toumey, now a surgeon in New York. His second marriage was to Miss Nannie Trowbridge of New Haven in 1908.

His ashes were interred in the Keene Forest, to which he was deeply devoted and which will be an appropriate sanctuary for his last resting place.

THE IMPROVEMENT OF COMPOSITION OF STANDS IN NEW ENGLAND

COMMITTEE REPORT TO NEW ENGLAND SECTION, SOCIETY OF AMERICAN FORESTERS[1]

Comparison of American with European Forestry

AUSTIN CARY sometime in the first five years of this century visited Europe to study forestry and on his return gave some illustrated lectures on forestry. To a student of forestry at that time the most thought provoking feature of those lectures were two companion lantern slides showing the relation between the cost of woods labor and the value of forest products on the two continents. In Europe wood was expensive and labor was cheap. In America wages were high and wood was cheap. One lantern slide showed a German woodsman with the value of his day's wages represented by a stick of wood about the size of a fence post which he easily carried over his shoulder. The other lantern slide showed a state of Maine lumberjack standing on a large spruce log perhaps forty feet long that represented the value of his day's wages in wood.

The central idea of this committee is to uncover and bring into use among foresters cheap means of increasing the few valuable elements in our existing stands as compared to more expensive methods of increasing forest capital that may be permissible in Europe.

In this country forestry will consist far more of finding a market for as many types as possible of wood material and then going out to the woods and finding, or, if necessary, growing such wood, than the European type of forestry which seems to consist largely of just growing wood and letting someone else find a market for it. In Europe, where there are fewer weed species than we have, it seems that there is a market as fuel or otherwise for the trees of inferior species or poor form on a very large part of the forest area. Whereas in New England there is only a small part of our forest area on which as much as eighty per cent of the wood can be sold if we measure the wood by European standards.

First Step in American Silviculture

Under these circumstances the cheapest and most effective step in American forestry is to use intelligence in the planning of existing logging operations so as to get the wood as cheaply as possible and at the same time to leave the forest in as good condition for the production of future wood supplies as is consistent with keeping present costs of logging as low as possible. Most timberland owners in New England think that they have already taken this first step, but it is quite possible that if they will carefully study their cutting operations again that some of them may find that they are actually cutting at a loss young growth or scattered old growth amongst young growth that could be much more profitably left for the next logging.

Additional Cutting Operations

In normal times next to more intelligent planning of existing operations the most profitable investment for a land-

[1]Presented at the annual meeting of the New England Section of the Society of American Foresters, at Boston, Mass., February 1-2, 1932.

owner seems to be the planning of additional cutting operations primarily to improve the forest. This is especially true in the removal of mature overwood permitting a promising understory to grow more rapidly or the removal from the forest of elements such as fuelwood which do not promise to increase in stumpage value.

Investing for Future Returns

If money can be invested in the forest with the expectation of improving the future sale value of the forest or for increasing the returns from future logging it may be done in three stages, before, during, or after logging.

A preparatory treatment before logging may cost very little such as the stimulation of growth on occasional seed trees by girdling worthless trees that retard their growth. In such a case the returns would be delayed several human generations. In the case of girdling to release crop trees from suppression the expense may be less than twenty cents per acre and a profit may be realized on the investment in less than ten years.

Investment at the time of logging may vary from a cheap silvicultural measure, like the leaving of occasional seed trees all the way through slightly expensive changes in logging and the leaving of small growth of doubtful present market value up to expensive changes in logging the burning of slash and the retaining of a large part of the present stand for the future forest.

Investment after logging may also vary greatly in the amount per acre from the girdling or cutting of a few potential wolf trees all the way up to complete replanting of the area followed by as many as three weedings to establish the plantation.

Most Promising Investments for the Future Forest

In seeking the less expensive means of improving existing stands this committee wishes to emphasize the desirability of carrying out all cutting operations with as much regard for the future forest as is possible within reasonable limits of expense. The application of reasonable intelligence to this subject seems to promise the best returns on the investment. Inspection of logging to prevent waste of the growing stock of young crop trees in roads and other construction work is a common form of investing for future forest values. Next to this seems to come the girdling of objectionable trees in its many forms of application. Then comes the weeding of the forest by cutting or topping of objectionable trees.

Results of Experiments

Your committee had hoped to present the results of several experiments at this time but partly due to the scattered location of its personnel we can present only the following: You have already received notice from Dr. Boyce's Committee of the application of girdling to the problem of improving stands that had been badly damaged by the white pine weevil and perhaps he will have something more to say on that subject.

Remeasurement of the Waterville girdling experimental plot on the area where only defective hardwoods overtopping spruce were girdling shows the following comparisons of the spruce on that and the control plot.

	Cubic feet		Growth about two seasons	
	1929	*1931*	*Cubic feet*	*Per cent*
Plot	425	510	85	20
Control	658	702	44	6 2/3

Girdling to Release Spruce

In general your committee believes that in the girdling of worthless hardwood trees to release spruce crop trees it is best to assume a diameter limit for the spruce to be released and then to girdle only worthless hardwood trees that are suppressing spruce trees above that diameter and not to girdle all worthless hardwood trees on an area. This makes the work cheaper and the results are better. It is believed that a succession of girdling operations is better than a heavy operation at one time. As an example we would suggest the girdling of worthless hardwoods fifteen years before spruce logging for the release of healthy spruce over five and one-half inches in diameter at breast height. Five years later if finances permit release spruce over two inches and again five years later release reproduction over four feet high. Thus at the time of logging the merchantable spruce would have been released fifteen years, those over two inches would have been released for ten years and the advance growth over four feet tall would have been stimulated for five years. The spruce in the smaller classes would have also received some incidental stimulation from the earlier girdling. Such a girdling to release spruce over six inches has been made at a cost of about two cents per spruce tree and less than twenty cents per acre. This suggestion is presented to supplement our printed report. To illustrate the application of girdling in this manner the Bolton girdling experiment may be used as an example. Here on one acre 36 spruce trees from six to sixteen inches, d.b.h. were released by girdling 26 hardwood trees. Incidental benefit to the other 68 spruce and fir trees over three inches d.b.h. as well as to smaller reproduction will undoubtedly be great.

New Experiments Undertaken

Among the new experiments that have come to the attention of your committee are the following:

A coöperative experiment in girdling hardwood to release merchantable spruce in Eastern Maine by Mr. Nutting, Extension Forester of the state of Maine.

The sample plot at Bolton, Vermont to study annually the effect of girdling hardwood to release spruce. This has been established and is to be visited annually by Mr. M. Westveld for the Northeastern Forest Experiment Station and by other members of the committee.

Experimental Forest for University of Maine

It is hoped by this time that the University of Maine will have accepted the lease of an experimental forest which was selected primarily for its suitability for experiments in girdling hardwoods to release spruce at the instigation of this committee and the lease was secured by the efforts of Mr. George T. Carlisle, Jr., of this section.

Proposed Experiments

In order to reduce the cost of weeding advance growth after logging your committee hopes to secure the starting of experiments to determine how most cheaply and effectively to kill certain red maple and other vigorously sprouting trees either before or at the time of logging. When these red maple trees stand isolated in the open after logging they persist in sprouting vigorously below the point where they have been girdled after the logging. If they are cut clean in the logging a very few such trees due to their vigor of sprouting add greatly to the cost of weeding the advance growth. It is proposed to test the relative cost of gir-

filling these red maple and other vigorously sprouting trees, say three years before the logging, in comparison with the cost of killing the stumps by poisoning or otherwise at the time of logging.

In some second-growth stands lacking in reproduction, shelter wood cutting may be employed in which one-quarter to one-third of the trees are removed opening up the stand sufficiently to establish a young understory. Some years later or just before logging operations are being withdrawn from the region the remaining trees with their increased growth may be cut. It seems very desirable particularly in the case of spruce to ascertain the increased cost if any of thus removing the merchantable material in two cuttings. This committee especially requests the assistance of all members of the section in securing any data and carrying on any experiments that may shed light on these two subjects.

Unemployment Relief Funds

The present urge to spend money on forest operations for the relief of the unemployed offers a good opportunity for the application of girdling and weeding. These operations can be effectively practiced during the winter and do not result in flooding the fuelwood market.

E. S. Bryant, *Chairman*
H. I. Baldwin
N. W. Hosley
J. W. Toumey
M. Westveld

CHEMICAL TREATMENTS TO SHORTEN THE REST PERIOD OF RED AND BLACK OAK ACORNS[1]

By CARL G. DEUBER

Assistant Professor of Plant Physiology, Yale University

In an effort to break the rest period of red and black oak acorns the author applied two treatments—immersion in a solution of thiourea and subjection to vapors of ethylene chlorohydrin. In each case germination was hastened with the thiourea treatment showing the greater promise.

ACORNS OF THE black oak group exhibit a type of dormancy which under natural conditions in the leaf litter of the forest floor extends from autumn until the following spring. When acorns of this group of oaks are brought into a greenhouse in the autumn and planted, germination may not take place until a period of three or four months has elapsed. Even then, the rest period will terminate for only a few acorns. When germination once starts, however, there is usually an increasing number of acorns completing their rest period and germinating over a period of from four to seven months from the time of planting. The dormancy of acorns of the black oak group therefore presents at least two problems of considerable interest, first, the development of methods that will hasten germination, and second, the development of methods to concentrate germination over a limited period of time so that all seedlings will have a uniform chance of becoming established. The present investigation is chiefly concerned with the application of chemical methods to hasten the germination of red and black oak acorns.

The factors causing delayed germination of the acorns of the black oak group have been investigated by Korstian (4). The enclosing structures of these acorns were found to be permeable to water. While the removal of the fruit coat hastened the germination of red oak acorns to some extent it did not quickly terminate their dormancy. An examination of the food reserves of the dormant embryos of red oak and scarlet oak acorns in November showed a relatively high percentage content of fat as compared with white oak and chestnut oak acorns. Analysis made of similar acorns stored until April of the following spring indicated a reduction in the fat reserves. From the evidence based on chemical analysis Korstian concluded that dormancy in the acorns of the black oak group is associated with the high fat content of the embryo which requires a rest period and temperatures higher than those required by acorns of the white oak group to become converted into soluble carbohydrates before germination will take place.

Shortly after Korstian's work on delayed germination of the black oak acorns, Denny (1) began publishing on the effectiveness of a variety of treatments with organic chemicals to hasten the sprouting of dormant potato tubers. This work led to the decision to try a few of the most promising chemical treatments recommended for potato tubers upon dormant acorns of the black oak group. From preliminary work in 1928 with acorns and maple seeds treated with ethylene chlorhydrin, sodium thiocyanate and thiourea, a fairly comprehensive series of

[1]Contribution from the Osborn Botanical Laboratory, Yale University, New Haven, Conn.

tests of the effectiveness of ethylene chlorhydrin and thiourea were planned for the autumn of 1930. These tests comprise the present report.

Procedure

For the first series of tests in 1930 acorns of red oak (*Quercus borealis* Michx.) and black oak (*Quercus velutina* La Marck) were collected on October 17 and within three days subjected to chemical treatment and planted in a greenhouse. A second series of tests was started on November 24 with acorns collected October 13. The acorns had been mixed with granulated peat moss and stored in a cool cellar for 40 days before being treated.

The chemical treatments consisted of (1) an immersion of the acorns in a solution of thiourea, and (2) subjection of the acorns to the vapors of ethylene chlorhydrin for 24, 48 or 96 hours. A 3 per cent solution of thiourea was used. This was prepared by dissolving 6 grams of thiourea in 200 milliliters of distilled water. Fifty red oak or 100 black oak acorns were placed in a liter bottle, the thiourea solution poured over them allowed to stand 15 minutes. The thiourea solution was then drained from the bottle, the bottle stoppered and allowed to stand in the greenhouse until the next day when the acorns were planted.

The vapor treatments with ethylene chlorhydrin consisted in placing 2 or 4 milliliters of ethylene chlorhydrin (technical) on a five-inch square of cheesecloth. The moistened cloth was placed at the top of a one liter wide-mouth bottle containing 50 or 100 acorns and tightly stoppered. The vapors were allowed to act on the acorns at the temperature of the greenhouse for 1, 2 or 4 days. Control lots of acorns were immersed in tap water 15 minutes, drained of excess water and allowed to stand in stoppered bottles one day before planting.

Results

The progressive germination of the control lot and of the chemically treated lots of red oak acorns of the first series (acorns which had not been stored) is given in Table 1.

From these data it is seen that germination of all the lots of acorns treated with vapors of ethylene chlorhydrin started within 34 days after planting. The acorns immersed in a solution of thiourea started to germinate 87 days after planting and the control lot 57 days after planting. In each of the chemically treated lots of acorns initial germination was followed by a period of very rapid germination. This is strikingly shown by a comparison of the germination observed in the control lot and the lot immersed in thiourea solution. Germination in the latter started two weeks later than in the control lot but by February 15, in a period of six weeks, 60 per cent of the thiourea treated acorns had germinated and but 8 per cent of the controls. By this time, 48 to 76 per cent of the ethylene chlorhydrin treated acorns had germinated. This early surge of rapid germination in the chemically treated acorns did not continue until complete germination was consummated. A slowing down of germination occurred which was followed by a period of rapid germination comparable with that of the control lot in the spring months. Total germination of the chemically treated red oak acorns on June 1, 223 days after planting, ranged from 80 to 96 per cent while that of the control lot was 64 per cent.

In Figure 1 the germination results of the first series of black oak acorns are plotted over a period of 210 days.

With these black oak acorns that had not been stored, the chemical treatments

initiated germination 67 to 90 days before germination occurred in the control lot. The ethylene chlorhydrin treatments produced an early surge of germination which then slowed down in rate after 90 to 130 days. This lag was followed by a second period of rapid germination in all cases but the treatment with the vapors of 2 milliliters of ethylene chlorhydrin for 96 hours. In this treatment early germination was accelerated to a greater degree than in the other vapor treatment but the number of germinated acorns at 210 days from planting was less than that recorded for the control group (the numbers being 54 and 65, respectively). Immersion in a solution of thiourea did not materially hasten germination of the black oak acorns until after 70 days from the time of planting. However, between 73 and 117 days a period of very rapid germination was observed. Although the rate of germination slackened somewhat after 117 days there was not the almost complete but temporary cessation of germination in this lot at this time as was found with the ethylene chlorhydrin treated lots.

In Table 2, the germination results are presented of a second series of red oak and black oak acorns that had been stored

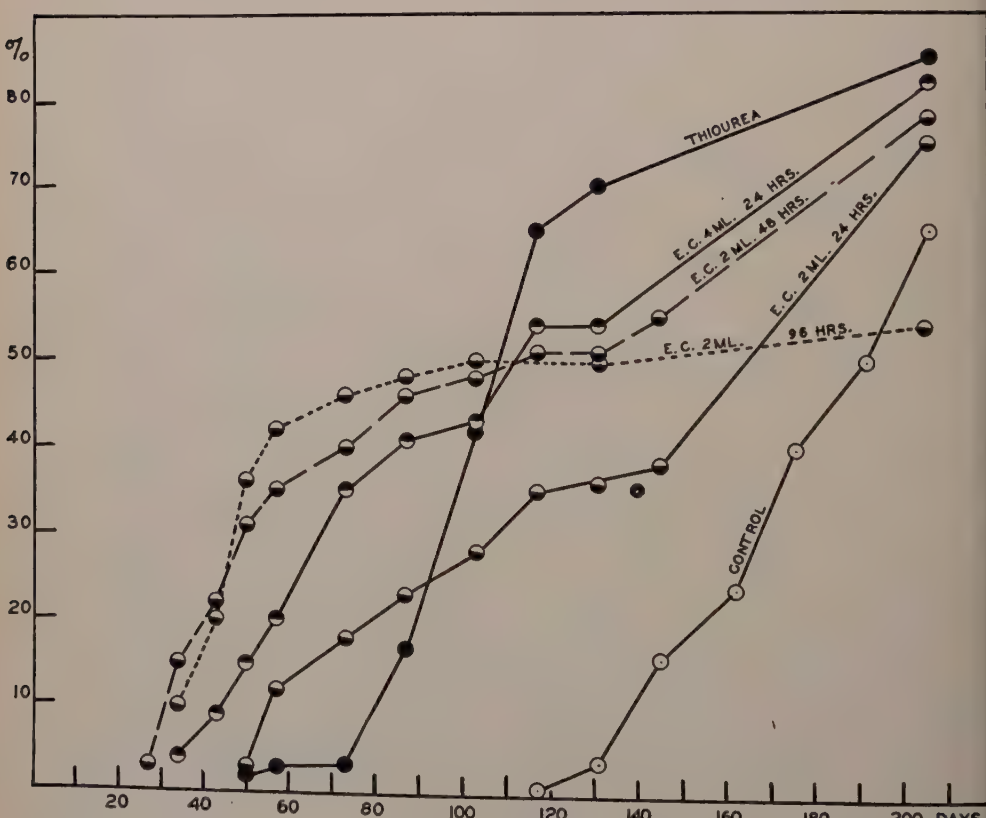

Fig. 1.

Fig. 1.—Course of germination of black oak acorns chemically treated October 19, 1930. The treatments were as follows: immersion for 15 minutes in a 3 per cent solution of thioureau (Thiourea), subjection to the vapors of 2 milliliters of ethylene chlorhydrin for 24, 48 and 96 hours, respectively (E. C. 2 ml. 24 hrs., E. C. 2 ml. 48 hrs. and 2 ml. 96 hrs.), and to 4 milliliters of ethylene chlorhydrin 24 hours (E. C. 4 ml. 24 hrs.). Each lot contained 100 acorns.

in a cool cellar for 40 days before being chemically treated and planted.

During the 100-day period in which these tests were conducted the control lots of red oak and black oak acorns germinated to the extent of 16 and 10 per cent, respectively, while the average germination of the chemically treated acorns were 58 and 51 per cent, respectively. In both the red oak and black oak acorn lots treated with the vapors of ethylene chlorhydrin for 96 hours. the germination was the lowest of the chemically treated acorns. The treatment with a solution of thiourea was distinctly slower in accelerating germination of the black oak acorns that were the vapor treatments with ethylene chlorhydrin. After the first surge of rapid germination with most of the vapor treatments of the acorns of both species there was a noticeable lag in the germination of the acorns. This period lasted for approximately 60 days. During the 100 days of this test the second period of rapid germination as observed in the first series was not attained.

Discussion

Only a few references have been found of work in which seed treatments with ethylene chlorhydrin, thiourea or similar compounds have been used. Kotowski (5) treated seeds of pepper, spinach and parsnip with ethylene chlorhydrin, ethylene dichloride, potassium thiocyanate and solutions of several inorganic salts. The compounds of ethylene increased germination in some cases and depressed it in others. Vacha and Harvey (7) reported that the dormant seeds of common buckthorn, high bush cranberry, snowberry and Tartarian honeysuckle were stimulated into early germination by subjection to ethylene or propylene gas. Trist (6) attempted to hasten the germination of basswood seeds by treating them with thiourea, sodium thiocyanate and ethylene chlorhydrin. The low germination percentages obtained are not convincing although it was claimed that the treatments with sodium thiocyanate and thiourea gave indications that they might be fa-

Table 1

GERMINATION OF RED OAK ACORNS CHEMICALLY TREATED OCTOBER 20, 1930
EACH LOT CONTAINED 50 ACORNS

Date	Control lot	Chemical treatments						
		Immersed in 3 per cent solution of thiourea for 15 minutes	Subjected to vapors of ethylene chlorhydrin					
			2 ml. per liter bottle			4 ml. per liter bottle		
			24 hrs.	48 hrs.	96 hrs.	24 hrs.	48 hrs.	96 hrs.
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Oct. 30	0	0	0	0	0	0	0	0
Nov. 8	0	0	0	0	0	0	0	0
Nov. 15	0	0	2	0	0	0	0	4
Nov. 22	0	0	4	6	8	8	14	16
Dec. 1	0	0	18	12	24	20	40	30
Dec. 8	0	0	18	16	28	20	46	40
Dec. 15	2	0	18	24	32	32	50	42
Jan. 1	2	6	20	30	48	34	54	50
Jan. 15	2	16	24	40	64	44	70	70
Feb. 1	2	38	44	48	64	52	70	74
Feb. 15	8	60	52	48	72	56	70	76
Mar. 1	10	—	—	—	—	—	—	—
Mar. 15	12	—	—	—	—	—	—	—
Apr. 1	24	—	—	—	—	—	—	—
Apr. 15	36	—	—	—	—	—	—	—
May 1	46	—	96	—	—	94	—	—
May 15	60	92	96	80	90	94	90	94
June 1	64	92	96	80	90	94	90	94

vorable. Ethylene chlorhydrin was said to be definitely harmful. Flemion (3) employed a wide variety of chemical treatments among which were thiourea and ethylene chlorhydrin to hasten the germination of *Sorbus aucuparia* seeds but obtained negative results throughout.

The present study of the influence of thiourea and ethylene chlorhydrin treatments of red and black oak acorns gives evidence of the possibility of shortening the rest period of a considerable percentage of these acorns by chemical treatment. The chemicals and methods used did not bring the rest period of all the acorns of a given lot to completion within a few days or weeks. In some cases, treated acorns began to germinate three months in advance of the controls and in all cases germination during the first 100 days from the time of planting was considerably higher in the treated lots than in the controls. The chemical treatments apparently had the greatest influence upon the least dormant acorns. The more dormant acorns completed their rest period at about the same time as those of the control lots. This explanation would account for the early high rate of germination of acorns in most of the chemically treated lots. The early period of rapid germination was followed by a lag in the rate at which germination was taking place and then a resumption of germination which more or less coincided with the progress of germination in the control lots. Storage of the acorns for 40 days before they were chemically treated gave slightly higher germination percentages at the conclusion of 100 days than im-

TABLE 2

GERMINATION OF RED AND BLACK OAK ACORNS CHEMICALLY TREATED NOVEMBER 24, 1930
EACH LOT CONTAINED 50 ACORNS

Date	Control lot	Chemical treatments: Immersed in 3 per cent solution of thiourea for 15 minutes	Subjected to vapors of ethylene chlorhydrin: 2 ml. per liter bottle, 24 hrs.	2 ml. per liter bottle, 96 hrs.	4 ml. per liter bottle, 24 hrs.	4 ml. per liter bottle, 96 hrs.
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
	Red Oak					
Dec. 20	2	2	6	0	2	6
Dec. 29	4	4	12	0	16	24
Jan. 13	10	32	36	54	48	24
Jan. 21	10	34	36	54	52	26
Jan. 27	10	46	40	60	58	28
Feb. 4	10	48	40	60	58	30
Feb. 10	10	58	48	60	58	36
Feb. 17	10	62	48	60	60	36
Feb. 24	12	66	50	60	60	36
Mar. 3	12	66	50	60	60	40
Mar. 5[1]	16	70	50	64	62	44
	Black Oak					
Dec. 29	4	2	24	10	28	18
Jan. 13	4	10	44	42	42	30
Jan. 21	4	20	46	42	50	30
Jan. 27	4	22	46	42	50	30
Feb. 4	6	22	46	46	54	30
Feb. 10	8	22	46	46	54	30
Feb. 17	8	26	48	46	56	30
Feb. 24	8	32	50	48	56	30
Mar. 3	8	32	50	48	56	30
Mar. 5[1]	10	50	56	56	64	32

[1]On March 5 the acorns were dug up and those that had germinated in the sand but which had not appeared above the surface were counted in the germination totals.

mediate treatment of freshly collected acorns.

The treated red oak acorns of the first series gave total germination percentages of 80 to 96 per cent at the conclusion of 223 days which may be taken to indicate freedom from deleterious effects. In this time, 64 per cent of the controls germinated. The treated black oak acorns germinated to the extent of 54 to 85 per cent in 206 days and the control lot, 65 per cent. The black oak acorns appeared to be more susceptible to injury by the chemical treatments than the red oak acorns.

An evaluation of the relative effectiveness of the several chemical treatments employed to shorten the rest period of the red and black oak acorns would not be satisfactory with the data at hand. All of the treatments shortened the rest periods of a considerable number of the acorns. Immersion in a solution of thiourea appeared to be slower in accelerating early germination than vapor treatments with ethylene chlorhydrin. However, when germination of the thiourea-treated acorns started it was maintained at a higher rate and with less tendency to lag after the first three months. This feature of the action of thiourea would strongly suggest a more thorough investigation of the possibilities of thiourea treatments in hastening germination and concentrating it over a short period of time. Vapor treatments with 2 and 4 milliliters of ethylene chlorhydrin per one liter for 24, 48 or 96 hours all hastened early germination of a considerable number of the acorns but the data do not indicate an outstanding good or poor treatment. The concentrations and time periods involved apparently did not cover a sufficient range to give decisive differences. In several instances the 96-hour treatments produced a lower final germination than treatments for shorter periods but in other cases this did not hold.

Summary and Conclusion

Chemical treatment in the autumn of the acorns of red oak and black oak by immersion in a solution of thiourea and by the vapors of ethylene chlorhydrin hastened the germination of a considerable number of the acorns. The thiourea treatment appeared to be slower in its effect upon hastening germination than ethylene chlorhydrin but thiourea influenced more acorns to germinate within a shorter time period than ethylene chlorhydrin. For this reason, thiourea treatments are considered to hold more promise than ethylene chlorhydrin treatments for effectively shortening the rest period of acorns of the black oak group.

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PLANTING EXPERIMENTS WITH PONDEROSA PINE IN NORTHERN MINNESOTA

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Experimental plantations of exotic or non-indigenous tree species always abound with interest. Occasionally too, an important find is made as for example the growth of the Monterey pine in New Zealand and Australia, and the growth of the Douglas fir in certain parts of Europe. For some years studies have been made at the Cloquet Forest Experiment Station of the growth possibilities of various trees. The present paper reports the behavior of ponderosa pine under various forest conditions in northern Minnesota. The results indicate that this species is not suited to the region.

DURING THE YEARS 1914 to 1917 forty-five plots of ponderosa pine (*Pinus ponderosa*) were planted at the Cloquet Forest Experiment Station. Four classes of stock, 2-0, 3-0, 1-2, and 2-1 were planted on the six sites used in the planting experiments. These sites were classified on the basis of existing vegetation which might influence the success of the planting and were described as cut-over barren; sweet fern; thick brush; young, dense jack pine; medium-sized jack pine; and mature open jack pine.

The stock was raised in the Experiment Station nursery. As nearly as can be determined the seed came from the Black Hills region.

Counts were made on these plots periodically up to and including the tenth year, after which they were discontinued. Although the results are negative in character, they are nevertheless of value in that they give a definite description of the behavior of ponderosa pine under various forest conditions in northern Minnesota.

Results of the End of the First Season

The survival at the end of the first season gives the clearest picture of the behavior of the different classes of stock on the various sites, since at that time the plants had not been subjected to the winter cold and early spring frost. Table 1 gives the survival of the various classes of stock on the different sites at the end of the first growing season.

The 2-0 class has the highest survival on all sites. Ponderosa pine is a tap-root species. At two years a fairly large thrifty seedling is developed before the taproot becomes prominent. This may have some bearing on the survival. Apparently the immediate ground cover had more effect on survival at the end of the first year than any overhead stand. The lowest survival was in the thick brush, while the highest was in the dense, young jack pine and the cut-over barren. On each of these sites there was practically no brush or herbaceous ground cover. There was more ground cover present under the mature, open jack pine and only a moderate amount under the medium sized jack pine.

Results at the End of 10 Years

If we were to judge by the survival at the end of the first growing season, ponderosa pine would measure up favorably with the indigenous species. The results at the end of ten years, however tell a different story. Table 2 gives the survival at the end of the tenth growing season.

Table 1

PERCENTAGE SURVIVAL OF PONDEROSA PINE AT THE END OF THE FIRST GROWING SEASON

Site	Class of stock 2-0	3-0	1-2	2-1	Average all classes
Cut-over barren	93	60	55	65	68
Sweet fern	75	48	68	69	65
Thick brush	53	32	25	20	40
Young dense jack pine	94	92	64	88	84
Medium-sized jack pine	84	62	62	44	63
Mature open jack pine	70	66	62	67	66

Except in the case of the 2-0 stock on the cut-over barren site, the survival is poor at the end of ten years. More disappointing still is the size of the stock. A planting that attains a development of from 2 inches to 13 inches in ten years is certainly not a profitable venture. On the average the 2-0 stock has given the best results throughout.

An examination of the comments on the condition of the plantings gives a probable explanation for the slow rate of growth. In many of the plots, especially where there was brush or other shelter present, the rabbit injury was heavy, usually recorded as 90 to 100 per cent. Since the trees were small, this injury was terminal, which is much more serious than injury of lateral branches.

During several seasons the comment was made in the notes that the buds appeared to be dead. Whether the killing was due to an early spring or a late fall frost or some other factor is difficult to determine. There is no record of the presence of rust in the plantations nor is there any evidence of it in the plantations at present.

Conclusion

The only conclusion that can be drawn from this experiment is that the ponderosa pine is not suitable for planting in northern Minnesota. Here and there is found an individual tree making fairly good growth. It is possible that a few individuals may prove to be hardy enough to survive. In which case, possibly a hardier strain may be developed.

Table 2

PER CENT SURVIVAL AND AVERAGE HEIGHT IN INCHES OF PONDEROSA PINE AT THE END OF THE TENTH GROWING SEASON

Site	2-0 Survival Per cent	2-0 Height Inches	3-0 Survival Per cent	3-0 Height Inches	1-2 Survival Per cent	1-2 Height Inches	2-1 Survival Per cent	2-1 Height Inches	Average Survival Per cent	Average Height Inches
Cut-over barren	63	8	10	12	4	12	12	10	22	10.5
Sweet fern	23	9	10	12	22	13	29	10	21	11
Thick brush	1	6	4	4	0	—	4	4	2	5
Young dense jack pine	0	—	1	—	1	—	0	—	.5	—
Medium-sized jack pine	15	2	1	—	1	—	2	—	5	2
Mature open jack pine	17	11	21	9	16	10	30	11	21	10
Average all sites	19	7	8	9	7	12	13	9	—	—

IMPROVING THE QUALITY OF SECOND-GROWTH DOUGLAS FIR

By BENSON H. PAUL

Silviculturist, U. S. Forest Products Laboratory[1]

It is not sufficient to strive for large size in growing timber trees. Large dimensions are not necessarily accompanied by desirable lumber properties. Quality, uniformity of growth rate and production of wood of a density suitable for specific uses should guide the silviculturist.

IN ORDER TO PRODUCE lumber of relatively high quality from second-growth stands of Douglas fir, the management of the stand should be focused upon the following objectives:

1. Relative freedom from large and loose knots.
2. Uniformity of growth rate.
3. Production of dense wood for special uses and non-dense for other uses.

The size of knots and the duration of lateral branches in a young stand of Douglas fir are greatly influenced by the degree of stocking of the stand. In very dense stands the side branches die and drop off while they and the tree trunks are still of small diameter. Trees grown under such conditions will produce a maximum amount of clear lumber because the knots will be small and restricted to a relatively small cylinder in the center of the tree. Furthermore, the percentage of loose knots will be reduced to a minimum. In many second-growth stands the trees are not sufficiently close together to accomplish this result and the natural stand should therefore be supplemented by planting in order to obtain sufficient stocking. In addition, trees that grow in well-stocked stands have better form and less taper than those growing in sparsely stocked areas.

Uniformity of growth is especially desirable in second-growth stands since the relatively small size of the trees makes it impracticable to cut separate pieces from the portions of the log containing wood of different quality as is now done in the manufacture of lumber from the large virgin trees. In the present second-growth stands of Douglas fir there is a tendency for a rather abrupt change to slower growth and heavier wood toward the outside as the trees become larger and the growing space more completely occupied.

Uniformity of growth can hardly be expected in second-growth stands without recourse to thinnings. Even in well-stocked stands after the lateral branches have disappeared from the lower part of the tree stems the removal of some of the trees is highly desirable. Furthermore, larger timber of high quality can be grown on a shorter rotation if thinning is practiced.

The methods for producing heavy, or dense, wood in second-growth Douglas fir forests are similar to those necessary for the natural elimination of side branches in closely stocked stands. Relatively heavy wood will be found all the way to the center in young trees that originate in stands where the trees are very closely spaced. Moreover, the production of dense wood will continue as long as the stands are not so closely crowded that the trees are stagnated or the stand is not opened up too much by thinning. The production of dense wood, however, usually requires a moderately slow rate of growth, since the annual rings must contain at least one-third summerwood in order to be classed as dense. In trees of rapid growth it is seldom that the

[1]Maintained at Madison, Wis., in coöperation with the University of Wisconsin.

Fig. 1.—A well-stocked stand of second-growth Douglas fir about 50 years of age. The lateral branches are dead and many of them have fallen. (Photograph by Pacific Northwest Forest Experiment Station.)

Fig. 2.—A partly-stocked stand of second-growth Douglas fir about 50 years of age. Although dead, the lateral branches are very large and persistent and are the cause of many large loose knots in the lumber cut from such trees. (Photograph by Pacific Northwest Forest Experiment Station.)

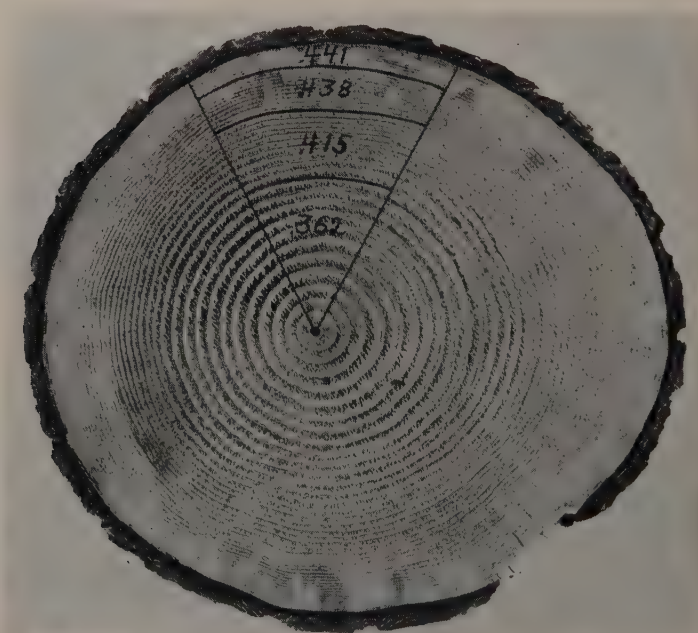
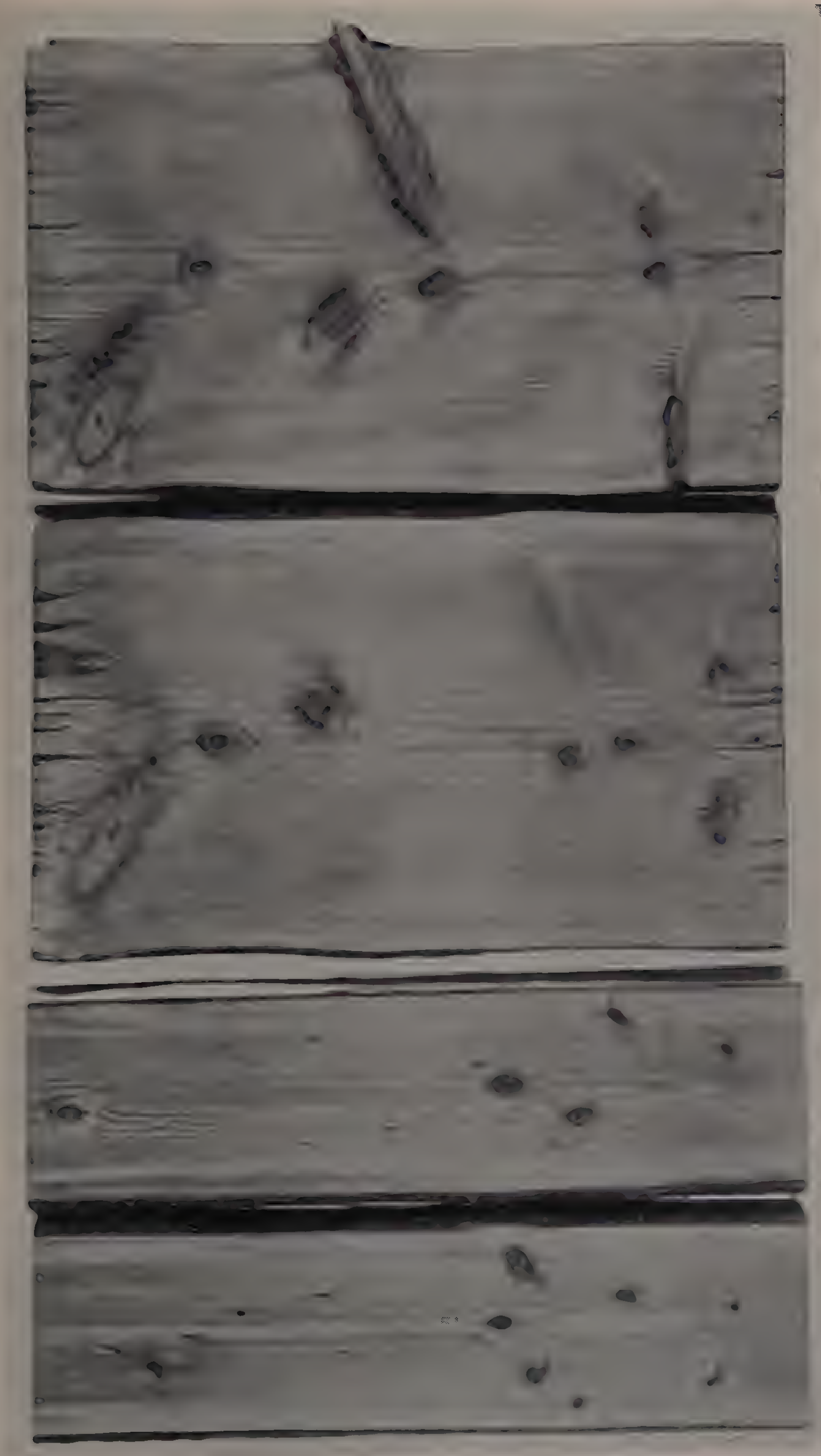


Fig. 3.—Variation in specific gravity in a cross section from a typical second-growth Douglas fir tree. Diameter about 14 inches.



B

A

Fig. 4.—A comparison of knots in trees from (A) closely stocked and (B) partly stocked stands of second-growth Douglas fir. The planks shown are taken at a height between 9 and 12 feet in the trees of even age.

proportion of one-third summerwood can be maintained. Consequently the production of dense second-growth Douglas fir lumber will require a longer rotation to obtain trees of a given size than for the production of less dense material. Whether or not the production of dense material will be profitable will, of course, depend upon the need of dense timber for special uses and the price obtainable for it.

In the management of second-growth Douglas fir, the silvicultural methods that tend toward the highest quality production are also the methods that will yield the greatest volume per acre of the most readily marketable products. Consequently attention should be given to the condition of the stand while it is yet in the formative stage. Allowing trees to grow that contain only timber of low grade is likely to cause an increasing liability. There is little demand for such trees if cut into lumber and if left uncut they continue to occupy land that should be devoted to the growing of better trees. In the end a reasonable amount of silvicultural care of second-growth Douglas fir stands should mean not only products of the greatest value but also the most profit in timber growing.

PRELIMINARY REPORT ON THE RELATIVE SUSCEPTIBILITY OF SUGAR PINE AND WESTERN WHITE PINE TO BLISTER RUST

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Effective planning of the control of the white pine blister rust in the sugar pine and western white pine forests of the West requires a knowledge of the susceptibility of these valuable tree species to the disease. The disease is already present in the western white pine forests and it is inevitable that it will soon appear in the sugar pine forests farther south. The authors' tentative conclusion that sugar pine is fully as susceptible as the western white pine and is probably much more so, indicates that the protection of the sugar pine will require drastic control measures to make it effective.

SINCE THE INTRODUCTION of the white pine blister rust (*Cronartium ribicola* Dietr.[2]) into western North America in 1910, each successive year has found the disease spreading farther from the point of initial infection at Vancouver, British Columbia (5), and, as a result, nearer to the valuable stands of sugar pine (*Pinus lambertiana* Doug.) in California. In fact, it has already been found on western white pine (*P. monticola* D. Don) in the Santiam National Forest in Oregon (1), which places it farther south than the northern range limits of *P. lambertiana.*

As early as 1888 it was known that sugar pine, growing under European conditions, was susceptible to blister rust (11, 14). Little information (2, 3, 8) was added to this bare fact until Moir in 1924 (7) stated that this species was very susceptible. No attempt to establish the degree of susceptibility as compared with other white pine species was made until Spaulding in 1925 (9, 10) gave sugar pine a tentative rating equal to that for northern white pine (*P. strobus* L.) and lower than that for western white pine.[3] Designating the last-named species as very susceptible (XXX), he classified the other two as susceptible (XX). Since the data on sugar pine susceptibility were meager, the project described in the present paper was outlined in 1923 for testing the relative susceptibility of sugar pine and western white pine to blister rust under natural infection conditions. Attempts to secure plants for the test were unsuccessful until 1926 when a quantity of satisfactory young trees was obtained. These plants, along with additional seedlings secured in 1929, furnish the basis for this study.

Establishment of Test Plots

For this study Daisy Lake,[4] B. C., was selected as the most suitable place within the range of blister rust. Small sugar

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[1] Pathologist and Assistant Pathologist, respectively, Division of Forest Pathology, Bureau of Plant Industry. The authors acknowledge indebtedness to J. L. Mielke and C. N. Partington for assistance in carrying on the field studies upon which this article is based.

[2] In American literature on *Cronartium ribicola*, the authority for the name has always been given as Fischer. Klebahn (4) and Spaulding (13) have recently decided that the correct authority is Dietrich.

[3] Spaulding in 1929 (12) gave additional data on the relative susceptibility of these three pine species to blister rust but did not change his previous classification. Practically all the data in his unpublished manuscript (9) is included in this 1929 publication.

[4] Daisy Lake is a stop on the Pacific Great Eastern Railway, approximately fifty miles, air line, north of Vancouver, B. C.

pine and western white pine trees were planted in mixed groups on three adjoining plots; Group I and II in April, 1926, and Group III in May, 1929.

Group I was composed of 13 sugar pine seedlings, one to two feet tall, from the Feather River Experiment Station, Quincy, California, and of 14 native western white pine seedlings of the same size from a place in the vicinity of Daisy Lake which was comparatively free of the disease and fairly remote from Ribes,[5] the alternate host of this fungus and the one on which the sporidia are produced. These trees were alternately spaced when transplanted, so that each sugar pine had a western white pine on either side of it.

Group II was composed of 34 sugar pine seedlings, approximately six inches tall, also from the Feather River Experiment Station, and of 35 western white pine seedlings of similar size, taken from the same locality as those in Group I. These seedlings were planted with alternate spacing, as in Group I.

Group III was composed of 126 two-year-old sugar pine seedlings from the Eddy Tree Breeding Station, Inc.,[6] Placerville, California, and of 130 two-year-old western white pine seedlings from the Wind River Nursery of the United States Forest Service, near Stabler, Washington. These seedlings were planted and spaced the same as those in the afore-mentioned groups. The basis in this group was greatly lessened because only 67 of the sugar pines have survived to the present time.

Each western white pine tree taken from the vicinity of Daisy Lake was carefully examined for blister rust infection at the time of planting and during the ensuing two seasons. A few cankers of doubtful origin were excluded from the test data. All nursery stock used was known to be free from infection at the time of transplanting, because no rust was present anywhere near the places at which it was grown.

Source of Sporidia

Although blister rust is common on Ribes in the vicinity of Daisy Lake, the sporidial supply near the test pines was considered inadequate for speedy and uniform infection. To expedite infection, therefore, Ribes bushes of the following species were transplanted adjacent to the plots: European black currant (*Ribes nigrum* L.), winter currant (*R. sanguineum* Pursh.), and stink currant (*R. bracteosum* Doug.). In addition to these plants, there were already a few bushes of the prickly currant (*R. lacustre* [Pers.] Poir.) growing in close proximity to the plots.

To increase still further the supply of sporidia near these pines, in 1926 heavily-infected winter and stink currant bushes were suspended from the fence around the plots. This procedure was not followed in subsequent years because infection was considered to be heavy enough on the transplanted Ribes bushes to furnish sufficient sporidia.

Time and Method of Taking Data

The trees in Groups I and II were given an annual fall examination in the years 1928 to 1931, inclusive, and those in Group III in the years 1930 and 1931. At each examination the height and crown width of each tree were accurately measured and the number of needles was carefully estimated. Each tree was closely scrutinized for evidence of infection, and each canker, when found, was tagged and given a number so that all essential data could be recorded.

[5] The genus name Ribes is used in this paper to include both currants and gooseberries.

[6] Now the Institute of Forest Genetics.

Size of Target

Inasmuch as *Cronartium ribicola* infects its pine hosts through the needles (2, 3), any consideration of the size of target necessarily involves consideration of the number of needles. In 1926 when Groups I and II were established, the seedlings of both species in each group were approximately the same size and had almost the same number of needles. This relationship gradually changed as the study progressed, because of the fact that western white pine tended to increase its number of needles somewhat more rapidly than did sugar pine. Thus, during 1928 and subsequent years when the number of needles for each species was estimated, the data show that the sugar pine trees had approximately fifteen per cent less needles than the western white pines of corresponding size.

This same ratio in number of needles on the two species existed in Group III.

Results

The incidence of cankers by year, group, and species is shown in Table I. The relatively few cankers recorded for the 1928 and 1930 examinations as compared with those found in 1929 and 1931 may be explained by differences in weather conditions during the years of infection. Thus, the hot dry weather that prevailed during the summer and fall of 1926 and of 1928—the times at which infection found in 1928 and 1930, respectively, would normally have taken place (6)—was unfavorable for pine infection. Conversely, the weather during 1927 and 1929 was favorable for pine infection.

Totalling cankers per species within each group and averaging for the number of cankers per tree, the comparison in

Table 1

INCIDENCE OF CANKERS BY YEAR, GROUP, AND SPECIES

Time of examination	Species[1]	Number of new cankers found Group I	Group II	Group
Fall	P. monticola	11	3	—
1928	P. lambertiana	8	3	—
Fall	P. monticola	42	8	—
1929	P. lambertiana	61	12	—
Fall	P. monticola	8	2	1
1930	P. lambertiana	6	0	1
Fall	P. monticola	29	15	10
1931	P. lambertiana	46	29	13

[1] Basis in number of trees for each species in each group remains unchanged throughout and is approximately the same for both species except in Group III where only 67 sugar pines are compared with 128 western white pines.

Table 2 is obtained. In assembling the data in this table, no consideration was given to the difference in the size of target for the two species. If such consideration were made, sugar pine would appear even more susceptible than the figures show, because of the fact that it had on the average somewhat fewer needles than western white pine.

Conclusion

These data show that under the conditions maintained in this test, *P. lambertiana* is approximately twice as susceptible to blister rust infection as is *P. monticola*. Such a ratio must be considered tentative, however, until further data have been secured. At present, the most that can be stated is that sugar pine appears to be at least as susceptible to blister rust as is western white pine.

Accordingly, in Spaulding's scale of relative susceptibility of white pine species to blister rust (9, 10, 12), *P. lambertiana* should be placed on a par with *P. monticola*, with the understanding that further study may bear out the present indication that it is considerably more susceptible.

Table 2

AVERAGE NUMBER OF CANKERS PER TREE FOR EACH GROUP AND SPECIES

	P. monticola				P. lambertiana			
Group	Number trees	Number trees infected	Number cankers	Average number cankers per tree	Number trees	Number trees infected	Number cankers	Average number cankers per tree
I	14	13	90	6.43	13	13	121	9.33
II	35	18	28	0.80	34	22	44	1.29
III	128	11	11	0.09	67	14	14	0.22
Total	177	42	129	0.73	114	49	179	1.55

Summary

1. An experiment to determine, under natural infection conditions, the susceptibility to blister rust of sugar pine as compared with western white pine was initiated in 1926 at Daisy Lake, B. C. Three test plots with a total of 114 seedlings of the former species and 177 of the latter were laid out and systematic data taken on them at periodic intervals.

2. To facilitate and speed up infection of these trees, numerous cultivated and wild currant bushes were transplanted into close proximity to the test plants.

3. At the beginning of the study, the size and number of needles of corresponding trees of the two species were practically identical. This relationship gradually changed until the sugar pines had approximately 15 per cent less needles than the western white pines.

4. At the end of the 1931 season there were slightly more than twice as many cankers per tree on the sugar pines as on the western white pines.

5. These data lead to the conclusion that *P. lambertiana* is fully as susceptible as *P. monticola,* and probably is considerably more so.

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A PRECISION DENDROMETER[1]

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A screw hook screwed into the wood of the tree is the stationary point from which the distance to the bark is measured with a micrometer, difference between periodic measurements giving the growth between measurements. The effect of variation in diameter due to transpiration pull is eliminated. By appropriate design, the point of measurement is placed outside the zone of stimulated growth resulting from penetration of the cambium by the screw hook.

TO DETERMINE the extent to which given conditions affect tree growth it is axiomatic that some method of measuring that growth be available. For this purpose, McDougall has employed a dendrograph capable of measuring and recording variation in tree diameter over short periods of time.

This dendrograph consists of a clock-driven recording mechanism supported by a band around the tree, the pen recording the movement of a system of links which make contact with the tree at opposite ends of a given diameter. Any change in the length of this diameter is transmitted to the pen and is recorded on a chart.

Such a dendrograph has two drawbacks; the first is the high cost (about $250) for each installation. The second, for most purposes, is that the recorded variation in tree diameter is a composite of increases due to bona fide growth and to expansion and contraction of the stem due to differences in the transpiration pull.

Opposed to these drawbacks is the advantage of continuous records, an advantage however which loses much significance when it is considered that the growth during very short intervals is considerably less than the instrumental error.

There is a definite need, therefore, for a method of measurement eliminating the effects of transpiration pull and for an inexpensive, non-recording instrument which will accurately measure tree diameter growth directly. It is the purpose of this article to present a method meeting the conditions imposed and to describe a small, rugged, and accurate dendrometer[2] employing standard articles of trade, thus insuring low cost.

The Method

The method is simple. As shown in Figure 1, a horizontal section through the tree, a screw hook H is screwed into the tree, penetrating the bark and entering the wood proper for one-fourth to three-eights of an inch. As growth proceeds the bark is pushed outwards, and since the hook H remains fixed in its original position, the distance D diminishes. The difference between measurements of D at given intervals is the growth during the elapsed period. Such measurements are easily made with a micrometer.

[1]This paper is a portion of a thesis for a master's degree in forestry at the University of California.

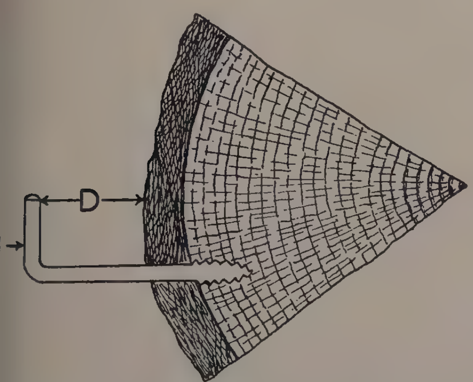
[2]Editor's Note: The term dendrometer has been applied by foresters more commonly to an instrument for measuring diameters at points above the reach of a man. The present author applies the term to an instrument for measuring growth. Literally, the term may be applied to any instrument used for measuring trees and would include diameter tapes, calipers, hypsometers and others. A more specific term is needed for growth-determination instruments.

The Bark Contact

To secure consistent readings with an strument of high accuracy it is imrative that the bark be provided with a etal surface or contact on which the miometer may bear. Such a contact may ke the form of a small round-head wood rew, a disc with a center-punch mark, a thumbtack with the point out. Minor odifications of the micrometer adapting to these three styles of contacts will be escribed later.

The round-head screw makes a satisfacry contact where the bark is thick ough. The screw used, the smallest vailable, is a one-fourth inch Number 2 ood screw. Such a screw requires that e outer bark be a quarter of an inch or ore in thickness, since the screw point hould not penetrate the inner bark to ny appreciable depth. Thicker outer bark hould be shaved down to a thickness of ne-fourth to three-eights of an inch to void any bark expansion or contraction ue to moisture changes and to avoid disırbance by bark fissuring or checking. A oat of waterproof paint or shellac over e cut bark will be advisable to reduce oisture changes.

The center-punched discs and thumbıck type of contact may be applied with ellac to bark of any thickness. Thick



ɪG. 1.—Screw hook used for stationary contact shown in place.

bark should be shaved down as much as possible without cutting into the inner bark. The discs should be about the size of thumbtack heads and the center-punched side should be outward. The thumbtacks should have flat, not convex heads, and should, preferably, be of brass. The point of the tack should be outwards to supply a definite contact point for the micrometer.

The Screw Hook

The hook used for the stationary contact is the Sargent Number 1912 *brass wire* screw hook. This particular make is preferred because the upturned end is somewhat longer than in other makes, which permits placing the moving contact further from the zone of disturbed growth surrounding the point at which the hook passes through the cambium.

The Micrometer

The particular micrometer as adapted for the growth measurements is shown in Figure 2 in position for making a measurement. The basic instrument is an Ames Dial Gauge, Number 66, with a spindle travel of half an inch. (Other makes are also available.) The dial is graduated in one hundred divisions representing thousandths of an inch and is movable to permit setting the large hand to zero. The small hand registers the number of complete revolutions made by the large hand, each of which indicates one hundredth of an inch. The instrument thus reads directly to thousandths of an inch. Metric gauges are also available.

The only changes made in the instrument are the addition of a notched collar A and an "anvil" B (Figure 3). The stainless steel anvil B, which bears against the moving contact (screw head, disc, or thumbtack point) replaces a convex-surfaced anvil. The notched collar A, which

bears against the hook (the stationary contact) is also of stainless steel. It is fitted snugly to the spindle housing D and locked in position by the small set screw E. The dimensions of the parts are given in the lower section of Figure 3, while the upper section shows the instrument in position for making the measurement.

Any good machinist can make the required changes. Care is needed in fitting the collar, which should fit snugly. If too tight, the spindle housing over which it fits will be compressed enough to bind the spindle. For the same reason, the set screw cannot be turned down too tightly. The set screw should fit its threaded hole snugly so it will not loosen. It should have a conical point to fit into a corresponding conical recess made in the spindle housing.

The anvil B, for use with screws as bark contacts, has a cylindrical depression just large and deep enough to encase the head of the screw. The bottom of th depression is flat, except for a conical de pression one-twentieth of an inch in di ameter which is intended for use with thumbtack contact, the point of the tac fitting into this small depression. For us with thumbtacks alone, the anvil may b made as at B′ (Figure 3) and for us with center-punched discs it should b pointed as at B,″ (Figure 3), the angle o the tip corresponding to that of the cente punch used.

Cost

The total cost of the micrometer, in cluding modification, is under twenty do lars. The hooks and screws cost approx mately two cents for each installation For a hundred dendrometers the total ou lay is approximately twenty-two dollar or twenty-two cents per installation. A the number of dendrometers is increase the unit cost decreases rapidly.

Fig. 2.—Showing use of dial gauge micrometer for measuring growth.

Installation Gauge

For the installation of the hooks and ontacts, a simple gauge is desirable. As hown in Figure 4A, this is merely a mall piece of thin wood, one-eighth inch bre board, or similar material, with two honograph needles inserted in holes paced the same as the distance from ontact center to screw hook center (S, igure 3). If thumbtack contacts are sed, a phonograph needle is placed in nly one of these holes (Figure 4b).

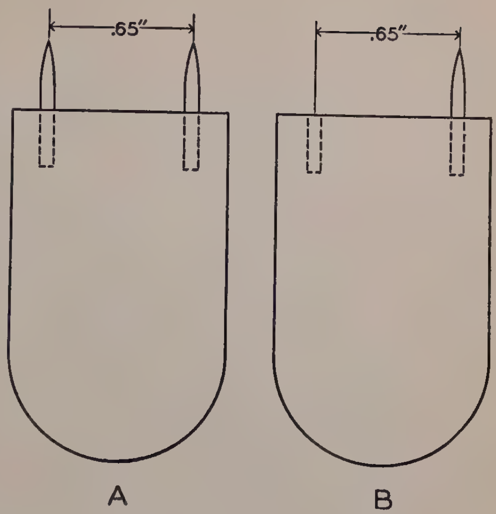
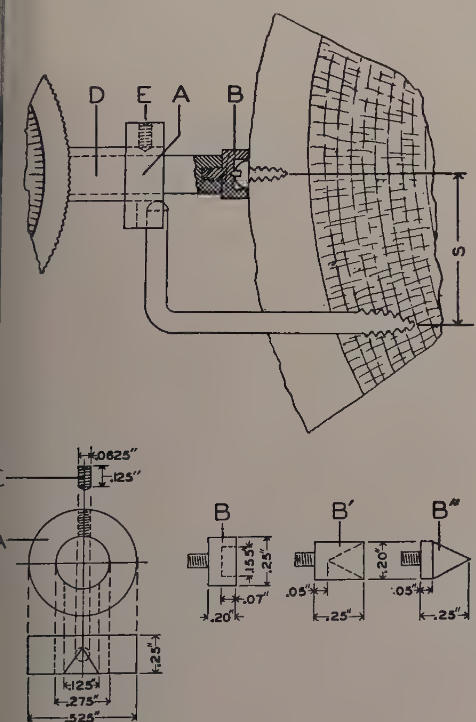


Fig. 4.—Gauge for establishing setting of contact points.

Installation

Installation is simple. The outer bark s shaved, if necessary, to the thickness uitable for the type of contact used. A eavy coat of shellac is applied immeditely. If a screw contact is used, the two-needle gauge is held with the needles at right angles to the axis of stem or branch (horizontally if the installation be along the main stem) and pressed lightly to make two marks on the bark. The screw is inserted at one mark and the screw hook at the other. A good screw driver, properly sharpened, should be used for driving the screw; the edges of the slot should not be burred since such burrs may cause inaccurate measurements. The screw hook shank should be inserted parrallel to a perpendicular radius through the screw; when screwing it into the stem, considerable pressure should be used when the point enters the xylem to prevent loosening of the bark, which would occur if the thread failed to take hold in the wood. The hook should be sunk one-fourth to three-eights of an inch into the *xylem*. Then, by sighting across the screw to the hook, the upturned end of the hook can be brought into a position parallel with this line of sight.



ig. 3.—Specifications for modifications in dial auge micrometer and for relation between stationary and moving contact points.

When the disc or thumbtack contacts are used, they are heated in a sootless flame to a temperature above the melting point of dry shellac. Finely crumbled

dry shellac is then placed on the heated surface. When the shellac is melted the disc or thumbtack is placed in position against the bark and held firmly until the shellac has cooled and hardened.

The two-needle gauge is used with the discs to locate the position of the screw hooks. One needle is placed in the center-punch mark and the other needle marks the hook position. With thumbtack contacts, the hole of the single-needle gauge (Figure 4b) is placed over the thumbtack point. The completed installations may well be protected from falling branches by a metal shield or block fastened above it, preferably without nails or screws.

For best results, the installations should be made in the fall, after cessation of growth, but in any case before spring growth begins. With fall installation the cambium, where it is penetrated by the hook, is stimulated least. The bark contact has sufficient time to come into equilibrium, insuring consistent and accurate measurements of the growth.

The Measurements

In making the measurements, a fairly delicate touch in using the micrometer is necessary. The hook will give slightly if much pressure is exerted upon it, and naturally any abnormal pressure on the bark[3] will produce a distortion easily registered on the micrometer. With ordinary care, however, replicated readings will check within one thousandth of an inch.

The one micrometer is used for measuring all installations. To make a measurement, the anvil of the micrometer is gently placed on the contact and the micrometer body moved down so that the upturned end of the hook fits into the notch of the collar, *with the end of the hook against the spindle housing.* A very slight twisting of the micrometer will insure snug seating of notch against hook. Only the lightest pressure is necessary to detect the position in which proper contact has been made. The micrometer is read in this position. It is well to practice making these measurements to develop a light touch. A uniform system of handling the micrometer will promote accuracy and speed.

Recording of Measurements

The measurements may be recorded as in Table 1. In Column 2 is given the initial measurement, from which successive measurements are subtracted to give the total growth preceding such measurements. These periodic measurements are entered in Column 3, the differences between the base reading in Column 2 and the values in Column 3 being the total growth, entered in Column 4 and curved in Figure 5.

Table 1

METHOD OF RECORDING DENDROMETER READINGS

(1) Date	(2) Base measurement (Inches)	(3) Periodic measurements (Inches)	(4) Total growth (Inches)
March 23	.230	.230	—
March 30	—	.230	—
April 6	—	.229	.001
April 13	—	.226	.004
April 27	—	.213	.017
May 4	—	.206	.024
May 11	—	.202	.028
May 25	—	.189	.041
June 8	—	.174	.056
June 22	—	.156	.074
June 29	—	.149	.081
June 29	.324	.243	—
July 12	—	.232	.092
July 27	—	.225	.099
Aug. 10	—	.221	.103
Aug. 24	—	.219	.105
Sept. 7	—	.219	.105

[3]The only pressure normally exerted on the bark is that of the spring which returns the micrometer spindle to its zero position. This is negligible.

Two entries have been made opposite June 29 to illustrate the recording when it becomes necessary to increase the distance between hook and moving contact by unscrewing the hook several turns. The measurement .149 inches (Column 3) is that prior to unscrewing the hook. After moving the hook the measurement becomes .243 inches. Adding to this the total growth to date (.081 inches) a new base reading of .324 inches is obtained. Subsequent measurements subtracted from this new base will give total growth as before.

Frequency of Measurements

For most purposes, weekly readings at the beginning and end of the growth season are all that are necessary. Bi-weekly measurements during the rest of the season will suffice. Intermediate values may be read from a graph of growth over date.

Modification of the Instrument

Various modifications of the equipment described can be made, of course. An ordinary screw micrometer can be adapted to do the work of the dial gauge but is not so convenient to use.

A triple support for the dial gauge can be employed, as in Figure 6. Supports A and B are conical-tipped, C is slightly rounded. The approximate spacing and orientation is indicated. The dial gauge is mounted perpendicular to a triangular plate with a conical depression D and a V-groove E on the under side, the apical angles corresponding to those of supports A and B. In making a measurement, the conical depression D is seated on A, the groove is seated on B and the third corner of the plate is seated against C. The original convex anvil of the dial gauge is retained and the bark contact may be a flat disc shellacked in place.

The installations described above indicated the growth at one point only. For measurements of the average growth of two or three points within a short distance of each other, the arrangement shown in Figure 7 may be used. A bar "A" (or a triangular plate) passes over the pin B driven into the wood and is attached to the bark at each end. (The triangular plate is attached at each corner.) The necessary micrometer fittings and method of measuring are indicated.

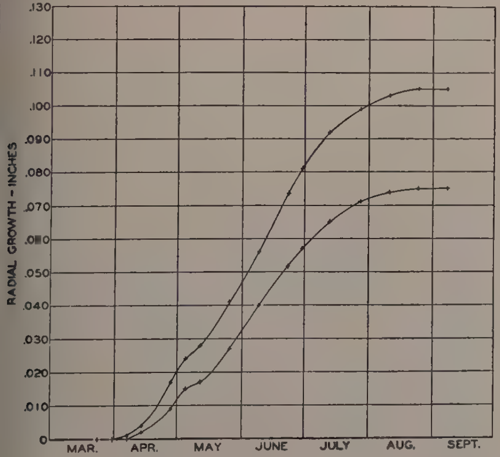


Fig. 5.—Graphical presentation of growth data.

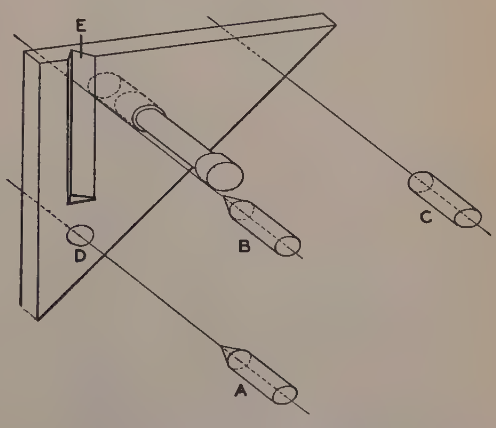


Fig. 6.—Triple support for dial gauge as an alternative for the method shown in Figure 3.

Results

Each dendrometer indicates at one point only (or the average of two or three adjacent points with the modified installation) the growth of xylem plus phloem. Characteristic growth curves are shown in Figure 5. The points are quite consistent and a smooth curve, from which intermediate values may be read, is easily fitted.

Whenever the cambium is injured the growth of wound tissue is stimulated. The wounding by the screw hook is very slight, especially if made some time before growth inception, and the resulting stimulus affects growth only within a very narrow zone around the hook. In a series of some one hundred and twenty installations on Douglas fir, ranging from the base of slow growing to the tops of fast growing trees, the maximum distance at which any measurable growth increase was found was 0.4 inch from the hook, the average distance being about 0.3 inch. After the growing season these dendrometers were cut from the trees and the wood sectioned in the horizontal plane through screw and hook. Ring thickness was measured under a microscope at three points, one in line with the screw, the others at a distance of 0.2 inch on either side of the first. The average ring thickness at the screw was 0.0684 inches. At 0.2 inch from the screw, measured toward the hook, the average thickness was 0.0814 inch, while the average value at 0.2 inch from the screw in the opposite direction was 0.0684 inch, identical with the thickness at the screw. A typical section is shown in Figure 8.

The micrometer fittings used on these dendrometers were somewhat different from the ones described here and required placing the screw only 0.4 inch from the hook. The present design places the contact 0.65 inch from the hook, giving greater assurance that the readings will not be affected by stimulated growth.

Summary

A simple, accurate, and inexpensive non-recording dendrometer is described. Growth of xylem plus phloem at the point of installation is followed by measuring with a micrometer the distance between the bark and a hook screwed into the xylem. As growth proceeds, the bark is pushed outward, the hook remaining in its original position, thus decreasing the distance between hook and bark. The difference between periodic measurements of this distance gives the growth during the period.

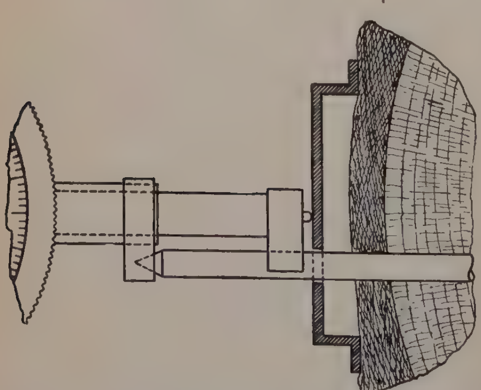


Fig. 7.—Modification for measuring average growth of two or three contact points.

Fig. 8.—Typical cross section at contact point showing freedom from influence of wound tissue.

By appropriate design, the point at which growth is measured is placed well beyond the zone affected by the stimulus of screw hook injury. Accurate measurements are secured by attaching to the bark a metal contact on which the micrometer bears.

The cost is less than twenty dollars for the micrometer, with fittings, and about two cents for each dendrometer. Since an unlimited number of dendrometer installations may be measured with one micrometer the unit cost is very low.

"The less Forest-Trees are pruned the better, particularly Pines and Firs. I never suffered any to undergo that operation, except when the stem become forked; in that case, the best shoot was preserved, and all others cut off close to the stem, with such side-branches as were too strong, and drew so much sap from the root as to prevent it properly expanding, for the greater encrease of nourishment to enlarge the trunk of the tree; the best soil for trees, is where the Hazel grows well. I do not depend so much on the richness of the soil for trees as gardeners commonly do, having observed most trees grow well in sheltered situations, and even on rocks."

A Treatise On Forest Trees, by William Boutcher, Dublin, 1784.

ARE FORESTERS GIVING GAME MANAGEMENT SUFFICIENT CONSIDERATION IN REGIONS OF CONCENTRATED POPULATION?

By A. E. MOSS

Professor of Forestry, Connecticut Agricultural College, Storrs, Conn.

Wild life, recreation, and other related forest land uses engage, more and more, a part of the American forester's thinking. This is timely. Mr. Moss' article makes an interesting analysis of game and recreation conditions in one of the more densely populated regions and raises some pointed questions which foresters must learn to answer.

IS THE DEMAND for recreation, stimulated by year-round roads and shorter working hours, going to require modification of standard management plans for forest property? If so, this condition should become evident in forested areas within regions of dense population per square mile.

Connecticut may well be used as an example for a forested region within an area of exceedingly dense population. Connecticut itself has a population of 333 per square mile. Adjoining regions show a much greater density; Rhode Island has a population of 644, Massachusetts 528, and adjacent counties of New York 2,900 per square mile. As a comparison it may be noted that the population of Belgium is 640, the Netherlands 625, and Great Britain 480 per square mile. Moreover, the forest policy of Connecticut has never been hampered by political pressure and throughout its thirty years of existence has been under the best of technical supervision. It may be assumed, therefore, that the present conditions reflect a normal development of technical forestry as influenced by population density and shifts in land use throughout this thirty-year period.

More than half of the acreage of Connecticut is now in forests, with the area of improved land under cultivation decreasing each decade, while the population is increasing.

In 1900 Connecticut had a population of 908,400 of which 115,825 lived in communities of less than 2,500 people, or a population density of 180 per square mile. In 1930 the population had grown to 1,606,900; of which 1,138,300 was urban, 394,900 rural non-farm, and only 80,200 on farms. At the same time, the number of operating farms decreased from 26,950 in 1900 to 17,200 in 1930. This is also shown in the decrease in improved farm land from 1,064,500 acres to 701,000 during the same period. This shows two very decided population movements. First, expansion of cities, and second a spread of the use of rural districts for residence.

If we assume the analysis of land uses of Connecticut as shown in Bulletin 127, Storrs Agricultural Experiment Station to be correct, we find that the area occupied for residential purposes by the urban and rural non-farm population has increased from 114,400 acres in 1900 to 231,400 acres in 1930. This only partially offsets the loss in improved farm lands of 364,500 acres. Other uses remain about the same.

	1900	1930
Land in residential use	114,400	231,400
Improved farm land	1,064,500	701,100
Land occupied by public roads	72,700	72,700
Land occupied by steam and electric rights of way	22,500	22,500
Land used for miscellaneous purposes	92,000	92,000
	1,346,300	1,119,900
Woodland, brush and marsh (nonagriculture)	1,743,700	1,970,100
Total land	3,090,000	3,090,000

This area of non-agricultural land has resented an important problem to those nterested in state development. Improved ransportation is making possible the development of many areas for residential urposes as shown by the fact that the 930 census classifies nearly 25 per cent f the population as "rural nonfarm." It s very possible that this is only the beinning of the movement. Nevertheless, here is a considerable area which will ot be needed for residential purposes for long time. This nonresidential, nongricultural land is, for the most part, lassified as forest or woodlands, and preents all conditions from open field to ully stocked stands, very few of which ontain merchantable saw timber. All forst precedent indicates that a portion of uch lands should be in public ownership. ducational work by forestry interests vorked toward this end, and as early as 901 an area was purchased for a state orest. The total results of twenty years' vork by the different state foresters as nembers of the Connecticut Agricultural xperiment Station staff and dependent pon appropriations secured through the acking of a Board of Directors and the tate Forestry Association was $20,000 vith which 4,452 acres of forest land was urchased for state forests. In 1921 the tate Forester was placed under the Forst and Park Commission in order that he program for purchase of state forests night receive the support of a state comnission which carried the idea of "recreaion" as well as "forests." This resulted s expected; $30,000 was appropriated luring the next four years with which ,079 acres were acquired as state forests.

In 1925 the state legislature passed an ct, the essentials of which are as follows:

"Section 1. The state park and forest ommission and the state board of fishries and game shall constitute a commisiion on forests and wild life. . . . ."

"Section 2. The commission may, in the name and for the use of the state, accept any gift or any interest in real or personal property to be used by the state park and forest commission, the state board of fisheries and game or the commission on forest and wild life as may be determined by the commission on forests and wild life for any park or forest purpose, for the purpose of propagation of wild life, for public shooting grounds or for recreation, upon such terms and conditions as may be agreed upon by the donor and the commission on forests and wild life. Said commissions on forests and wild life may purchase or lease real or personal property to be used for any of said purposes, provided said commission shall purchase no real estate at a cost in excess of ten dollars per acre without the approval of the board of control."

"Section 3. Said commission on forests and wild life may provide for the propagation and preservation of wild life in any state park or forest as it may determine."

This commission adapted a set of by-laws of which one is of special importance.

"Article III., Section 1. Acquisition of land shall be confined to definite purchase areas approved by the commission, and the land acquired shall, so far as possible, be suitable both for timber production and the propagation of wild life."

The only change over the preceding set-up was to bring in the backing of the sportsmen and wild life conservationists by making a definite statement that the lands were for the purpose of propagation of wild life and for public shooting grounds. The instructions of the commission as outlined in their by-laws carries out this intent. Immediate results were evident. The purchase appropriation for the biennial period ending in 1925 was $20,000 while the new commission received $150,000 in 1925, $125,000 in 1927, and $63,135 in 1929. The total appropriation

from 1902 until 1925 had been $50,000, and the area acquired by gift and purchase was 11,531 acres. Since then the new commission has acquired by purchase 35,460 acres and by gift 6,750, a total of 42,210 acres for a five-year period as compared with 11,531 for a twenty-three-year period. Of course, some of this increase is due to the effects of an educational campaign, but a considerable proportion of the increase must be attributed to bringing in the recreation of the sportsman as a definite element of the set-up.

The reasons for this situation are very evident. The number of sportsmen per 1,000 of population is fairly constant. Urban population is dependent upon rural land for its recreation. Modern transportation permits considerable spread for this recreation and, therefore, places a recreation value on all suitable areas within a region of great population density. Moreover, each increase in rural nonfarm population means an area developed for private enjoyment and an addition to the "Trespassing Forbidden" area. The reduction of forest crop area is not evident, but there will be a decided increase in the older age classes on lands so developed.

The element particularly affected is the sportsman who is dependent for at least a portion of his recreation on land not owned by himself. Organizations of sportsmen may lease areas, but a great percentage of those desiring to hunt or fish will not have the financial means to belong to such organizations. This group is becoming increasingly dependent upon public owned lands, and this pressure is reflected in the stimulated purchase program as indicated above.

Does recognized sound forest practice which is for the production of timber crops provide for this increased use of the land?

Recreation along other lines than "for the propagation of wild life" fits into timber crop production very well. Suitable habitats for wild life may or may not fit into a standard forest management plan.

The "General Program for the Development of Forest Resources in New England for the Decade 1929-39," as outlined by the New England Forestry Congress in 1929, has for objective A "to restore the depleted and deteriorated forests of New England to full productiveness, that they may render the maximum service to the region as sources of raw materials for its industries, for watershed protection, and for recreation and scenic values. Other significant passages are:

"2. The extension of state ownership of forest land to include ultimately at least 10 per cent of the forest area of the region in order; - - - - -

"d. to serve as open hunting and fishing areas, as sanctuaries for the propagation of game birds and animals, and as recreation areas."

Full productiveness for the above objects does not necessarily mean a full stand of timber if the area is of more value for some other form of species. "Wild life" includes both game and non-game species. The sportsmen are interested in the game species and their enemies; the wild life conservationist is interested in all species. The game species in Connecticut are very limited and include rabbit, racoon, and squirrel for mammals, and ruffed grouse, woodcock, quail and pheasant for upland game birds. The life habitats of the above species must be considered if public land areas are to fulfill their purpose when "Wild Life" and "public shooting" is a recognized objective.

The quail and the pheasant are farm land birds and rarely occur in cover within the wild land purchase areas. The ruffed grouse and the woodcock are woodland birds and are within the purchase

reas. The squirrel and the racoon are orest land animals, while the rabbit is rimarily a brush land animal. More port is derived from rabbit hunting than rom the racoon and squirrel hunting ombined. Woodcock are increasing in nportance as the effect of the migratory aw becomes more evident. As these birds re migratory they occur as flight birds ound on their feeding grounds. Their ood is largely worms and therefore they re not found in coniferous stands.

Ruffed grouse is the game bird of Conecticut. This bird is to Connecticut what he migrating wild fowl is to central and estern United States. The uplands of onnecticut are noted for their grouse hooting. Recent studies of the habits of his bird made in New York may serve to hrow some light upon the reason for this ird being able to survive the intensive unting of this thickly populated state.

Grouse has a very strong habitat reuirement. Each season of the year they re found in a different type of cover:

Large hardwoods or dense conifers, inter shelter.

Small hardwoods and conifers, spring esting grounds.

Overgrown lands or brush fields, sumer and fall feeding grounds.

Open fields—purpose unknown—possily insects.

During the summer a brood of grouse spends approximately 48 per cent of its time in the overgrown brush lands, and 6 per cent in open fields.

Grouse are not found where the above combination of conditions are lacking.

Rabbits probably provide as much sport and more meals than all other forms of game combined. Rabbits are entirely dependent upon brush areas.

The area most devoid of wild life is a pure stand of conifers; old growth timber of any kind follows a close second. The combination of old fields, brush pastures, and second growth hardwoods has in the past furnished to this region an abundance of food for the ruffed grouse and the rabbit. A continued program of complete forest cover will eliminate these so-called "waste land types" from the forest areas. With their elimination there is very serious danger of an immediate reduction of the important game species. This will take place on publicly owned lands first, as these lands are the only ones that are being intensively managed on a long time basis.

If the forest profession is to profit by the support of the "Wild Life Conservationist" and the "Sportsman," immediate steps must be taken to give recognition to their needs in developing plans of management.

THE NEW APPROACH IN EXTENSION FORESTRY

By W. K. WILLIAMS

Extension Forester, U. S. Forest Service, Washington, D. C.

Extension foresters are finding that they must fit their demonstrations and recommendations to the changed economic conditions. Mr. Williams' article indicates that this comparatively new type of forester is alert to the present needs and able to cope with them.

During periods of depression when farm woodland owners find themselves in the gloom of low prices there is cause for re-examining the whole structure of extension forestry work with farmers with a view to eliminating doubtful production practices not in line with the present changing economic order. This entails not only a study of results and an analysis of all possible facts as to the character of practices now being extended, but also the methods involved in the distribution of information to the community of woodland owners.

In looking at the results of the past year we find that numerous adjustments in programs were made. New ideas were advanced and constantly improved standards in presentation were set up with an increased recognition from farm woodland owners. There is a little hesitancy in attempting to measure results as they are not all tangible and some have not materialized at the close of the year. The measurement of any one year's work in extension, like any other educational pursuit, would fail to evaluate a full expression of the accomplishments. However, in terms of projects completed we find at the close of 1930 that the agricultural agents in the states reported 5,748 adult projects completed and 5,379 junior projects completed during the year. The adult figure is an increase of 18 per cent over the previous year while the junior work shows a 40 per cent increase.

While these results, involving contacts with hundreds of thousands, indicate an increase and have elements in them that point to success they do not reveal the character of the work which is based on a study of facts involving the farm woods problems, or the nature of the solutions interpreted in the light of economic changes. These economic conditions which have for the most part been of an adverse nature present a challenge to the extension forester, to some degree upsetting theories and making past recommendations obsolete. It does not change materially the general project presented such as improvement cutting, planting, etc., but as indicated it does call for changing of some recommendations and a placing of different emphasis on others.

Farmers, like all other groups, have suffered from the depression. This has developed a tendency as a group to manifest greater interest but to move very cautiously until some assurance is received that the step considered is leading to profit and not to loss. The proposition must be offered to him somewhat complete with emphasis on

costs, how it can be handled with the least trouble and worry and with the greatest returns. This puts the extension man who has a wealth of facts at his disposal in a favorable position. Or on the other hand it may be an awkward position to one who has not kept his subject-matter structure abreast with the rapid changes which have affected all phases of extension forestry work. Teaching practices and production practices have been undergoing changes which call for new approaches and new solutions based on a full consideration of the elements of difficulty involved in growing timber.

As an example of the approach used in meeting changed conditions we can take at random some work conducted in North Carolina. The extension forester there, having to consider depressed markets and the slow movement of the usual products as pulpwood, sawlogs, etc., studied the farm woods situation as a possible source of revenue and found that North Carolina has more than 50,000,000 cords of wood suitable for fuel which should be removed from 12,000,000 acres of woodlands as one of the first steps in putting that area under management. Just how to use this material to advantage both to the woodland owner and the fuel consumer presented its difficulties. The desirability of wood as a fuel and its heating value as compared to other fuels were brought out. The matter of how to profitably dispose of this vast amount of material of no value to wood-using industries and of little value to the farmer with a surplus in his woods constituted the larger problem from the individual farmer's point of view and one which naturally affects the welfare of the entire state. The answer lay in the greater use of fuelwood by industries, farmers and others who have been disposed to use other materials, thus permitting the larger part of their fuel expenditures to go out of the state rather than keeping them within. In circular letters to industries, to county agents, superintendents of schools, and other agencies, it was stated "North Carolina citizens can increase the circulating wealth of the state by creating a market for this great amount of fuel." In sloganizing, this wording was used to sound the new note of economy "North Carolina Fuels for North Carolina Fires." These efforts which are in line with redirecting the extension improvement cutting project are not without some encouragement as trustees of schools, private citizens, and business enterprises have shown interest in the idea and wood-burning equipment is being installed in some cases. Although it is recognized that this new effort will not entirely solve the problem in North Carolina, it does point to a possible outlet and it does have tremendous potentialities which should help the woodland owner in continuing to derive some revenue from his woods; otherwise that source of a supplemental income may have been reduced materially. There are several points in the development of this project which are rather interesting to consider: (1) A study of facts and conditions made. (2) Farmers' problem determined and solution developed. (3) Possible markets analyzed and circularized. (4) Teaching better practices by establishing demon-

strations. (5) Definite follow-up work planned.

It appears that with a good approach to solving a problem and with the greater use of economic information there is no reason why this project should not receive just consideration.

Another example taken from Virginia brings out the use of recommendations which oppose the usual trend among woodland owners to carry on extensive cutting during periods of general depression. The foresters connected with the agricultural college have given the marketing condition intensive study and as would be expected, farmers are being advised regarding markets as well as prices offered for the different farm timber products.

In responding to requests as to whether it is advisable to cut certain kinds of wood products for the market the extension forester has in many cases used an emphatic No. There is virtue in holding back or in sounding a warning note preventing what might have resulted in a loss had the operation been encouraged or permitted to go on. This may sound trite to those who have had long experience in forestry but how many have seen the cutting of valuable trees into crossties when they might have produced more as sawlogs? Or how many have seen other operations go unchecked when they might better have been halted (with probable future benefit to the owner) through the use of a negative recommendation?

In discussing the marketing work the extension forester of Virginia has said, "The important point has been to prevent or discourage cutting for an already glutted market, my position has been, cut it if you can sell it without too much sacrifice, but sell it before you cut it." This statement obviously implies a consideration of growing and marketing facts prior to cutting. This approach to the marketing problem is sound.

Again if we turn to the Pennsylvania extension work we find changed tactics are invoked to effect economies in cutting young timber. The application of silvicultural practices which are conducive to more immediate returns and lower cost production of wood are being emphasized. There is a breaking away from some practices and an application of others offering more favorable opportunities for profit and sustained improvement. Without going into the details of the practices involved several changes in Pennsylvania procedure could be cited such as lengthening the span of years before the first thinning, to eliminate costly cutting of unmerchantable sizes and to insure better labor return or profit from the first thinning. Other contemplated changes for conducting thinning and planting operations with descriptions of these practices could be mentioned, but these matters are of secondary importance in this discussion. The important consideration in regard to the Pennsylvania work is that the subject-matter structure is being re-examined, ideas are being recast, tested for economies and translated into terms of increased management efficiency.

Other expressions of changed tactics to meet changed conditions could be cited from numerous states, as in

the case of Indiana where the extension forester in analyzing the forestry needs of farmers in view of the demand for high grade timber by wood-using industries has developed the slogan "Grow Quality Timber." This note will be sounded like a bell or ring through his entire farm forestry program. The growing of quality products is not new in agriculture but applying it to timber and aggressively not common in forestry.

The business depression has forcefully re-emphasized the old idea that quality products have markets and bring better prices when the lower grade products can find no buyers in the market. To translate this idea, to vitalize it and make it a living part of the forestry program commands attention.

In further exemplifying the modernizing of the approach and the use of diversified thinking it will be interesting to note an incident which took place in Illinois. An improvement cutting demonstration was scheduled to take place on a farm in one of the counties in southern Illinois. A good group of farmers was in attendance. The extension forester and county agent were on the job. The farmer had his teams and other equipment in readiness for use in logging the stand in accordance with the recommendations to be made, but not a tree was cut or a log taken out. Farmers were given the elements for properly cutting the stand in question and were drilled in marking operations with all men taking part. The farmers were satisfied, the owner expressed appreciation and his intention of adopting timber growing methods. The meeting was dismissed. The extension man had thought through the problem—timber prices were in a falling market, and there was an uncertain demand for products. No actual cutting could be done under these unstabilized marketing conditions nor was it possible at that time to determine the most profitable product to cut. In view of these conditions there was no sure basis for marking and working the trees into any one product would have been hazarding a risk. In this instance the farmer gained a new slant on the timber situation. The trees still stand, laying on increment and will undoubtedly be harvested when the situation adjusts itself and is favorable to a profitable operation. To go ahead in practical timber growing requires keeping ahead. In other words, under present conditions facts are paramount in any successful attempt in marketing timber. In other states as in Illinois, economic appeals are going forward to farmers and their consideration is urged. As one man has said "Naturally, these appeals slide under the skin. They knock at the door of common sense farm management."

In the communication of these new approaches in extension forestry the ordinary methods of extension are used and also numerous other devices and agencies are brought actively into play in one form or another. However, for these to be effective the forester must be sold to his own wares and embrace the opportunity to work out solutions based on the latest economic data and to follow the program developed with story-telling demonstrations. Surely the approach to the solution of the problem is made with enthusiasm and as

Emerson says "Nothing great was ever achieved without enthusiasm." But there is no place in extension forestry for that type of enthusiasm which leads to air castles of paper profits or down blind alleys. Determining a farmer's forestry problem, casting aside sentiment and facing the difficulties of making timber growing a profitable pursuit, shaping up a program and correlating it with the system of farming in vogue is a challenge which compels clear thinking and deliberate speaking of the truth as we may see the truth according to the new order of economic conditions.

The Atlantic Coast Line Railroad Company will continue its educational fight this year against the old southern custom—woods-burning, O. F. Cooper, advertising agent of the railroad, has informed the American Game Association.

Statistics gathered by the company from official sources, he said, show that prevalence of the practice of seasonal woods-burning can be held accountable for the fact that approximately four-fifths of the forest area burned over in the United States every year lies in the South. He termed the "custom," "an economic crime."

For several years the railroad has distributed educational matter in the six states which it serves and directed its agents to stress the great economic value of unburned woodlands and abundant wild life.

"Although nothing is more indicative of the progress that is being made in the South than the changing attitude of the people with respect to forest fires," he pointed out, "the greatest single enemy to game is still the prevalence of woods-burning, an obstinate problem of state foresters."

Spark screens on Atlantic Coast locomotives and other precautions reduced fire claims against the company 30-fold between 1926 and 1929.

PUBLICITY: FORESTRY'S NEGLECTED HANDMAIDEN[1]

By HENRY E. CLEPPER

Pennsylvania Department of Forests and Waters, Harrisburg, Pa.

The author believes that the forestry profession has been haughty and contemptuous in its attitude towards publicity. Its writers have been too scientific when writing on the problems of handling timberland. They have not known how or have been too dignified to tell the public in simple language and in an interesting way what forestry is and what foresters are trying to accomplish. In his opinion their lack of ability to tell their story, or rather their unwillingness to unbend when writing of forestry problems, has not only retarded the development of forestry but has left the field of publicity concerning forestry to "sob sisters and feature writers." He makes a strong plea for specialized training in straight forestry publicity.

IF THIS MODERN AGE of machines and merchandising has one thing of significance to teach us it is this: that no matter how remarkable and how useful the contributions of science and invention to humanity they are given scant application without salesmanship. The time has long since passed, if it ever actually existed, when the world would make a beaten path to the door of the maker of the best mouse traps even though he lived in a deep and impenetrable forest. It is an incredibly naïve fancy to believe that people generally possess an unerring judgment of what is best for them, or even good for them. Either advertising or publicity, and frequently both, carried on over long periods of years is often required to impress the general public of the desirability of following a certain course of conduct for its own good. Such, as for example, using caution in crossing railroad tracks or preventing fire in the woods.

At the present time a tremendous unsolved problem, of intimate significance to the forestry profession, confronts the nations of North America: how to safeguard the great natural timber resources from their two most destructive enemies, fire and wasteful exploitation. Consider the second of these. What has been accomplished in the way of imparting enlightening information to the public which will result in its demanding or permitting that over-production and wasteful cutting cease? The answer is, nothing.

Foresters have written and talked convincingly of the possible consequences of a deforested America, economists have contributed their weighty logic, the lumber industry has formed a Greek chorus with a reïterated refrain concerning compound interest, liquidated holdings and mergers, and politicians early agreed that something ought to be done about it. With what result? The public at large is simply not interested; small specialized groups who might be concerned soon become befuddled and take up something easier of comprehension. But why should the public be interested anyway? Because without public sanction there will never be any tinkering with the anti-trust laws which might permit the lumber industry to coöperate in restraint of over-production and practice forestry or any congressional action which might permit the government to regulate exploitation and force the practice of industrial forestry.

Foresters generally have been considerably more successful in their publicity concerning the sentimental aspects of

[1] Presented at the Annual Meeting of the Allegheny Section of the Society of American Foresters, at Baltimore, Md., February 26-27, 1932.

trees and forests than they have with the economics of forestry. There are, of course, reasons. But the conclusion is irresistable that the public has little or no interest in the weightiest of the problems confronting our timber resources for the simple reason that those who attempt to explain them are incomprehensible when they should be illuminating. Much of the information designed to interpret facts of economics to the unscientific dulls the imagination of the reader or listener instead of stirring it.

I believe there are at least two reasons why our forest economists have been successful in reaching a small part of the lay public only, and that part the well informed proportion. In the first place it is hard to explain a complex subject simply. In the second place many men with the scientific attitude believe that it would somehow be prostituting their abilities if they were to write down to an intelligence with a lower common denominator than their own, that they would be substituting clever journalism for exact logic.

Well, no one should be condemned for refusing to put aside his dignity, even if only to the point of hustling in mental shirt-sleeves for public support in competition with a host of others bidding for a share of it. But neither should those refusing to talk with the public in language that it can understand find fault if the public prefers to listen to, and acts upon, the suggestions of those it can comprehend. To carry out certain objects, which the forestry profession in this country largely believes are essential, it is imperative that a vast uniformed multitude be educated in the rudiments of our present knowledge of those objects. Who is to be responsible for this education, and how is it to be provided?

One thing is sure: if foresters are to compete with manufacturers of cigarettes and purveyors of breakfast foods for public attention, the cloth of their language must be cut to fit the popular mind. Or, if they cannot unbend so far, they must become reconciled to seeing the job delegated to someone else. This alternative, I believe, the forestry profession is unwilling to condone.

There appears to be a growing resentment in the forestry ranks, a resentment the present writer shares, of having the news of forests and forestry written so largely by sob sisters and feature writers of the Sunday supplement school. And yet these literary gentry catch the popular fancy with their "fresh air" journalism while the scientific writer, who, after taking pen in hand, attempts to break into the columns of popular newspapers and magazines, has his articles politely rejected on the plea of lack of space, but actually because they are too dull. The question is, whether foresters are to stand aloof from competition with the clever journalists, or whether there is a sufficient number of them willing to throw overboard their dignity and hustle with the purveyors of snappy copy for news space? There is one thing that those who elect to engage in sporting competition with the hacks, in order that popular forestry may be written at least from an authentic forestry viewpoint, may expect; and that is that they will receive little or no encouragement from the more dignified members of the profession.

If this last statement sounds unfair, consider the article in the February, 1932, issue of the JOURNAL OF FORESTRY, *American Forest Literature From A Bibliography Point Of View*, by James L. Averell, and read his apparent condemnation of the recognized use of provocative titles intended only to catch the reader's eye. And why does he dislike their use? Because they are difficult to index properly in library card catalogue systems. Fortunately, the editor of the JOURNAL, with his customary balanced viewpoint, appends a note to the effect that the piquant

le does occasionally have its place and efulness.

(And here the present writer hastens in rn to make it clear that, though he dis-grees with the author on this one minor oint, he finds the article in question one the most informative on the subject of e literaure of forestry that has appeared lo! this many a moon. Mr. Averell is vidently performing an important, but ifficult and monotonous job with com-endable dispatch.)

John D. Guthrie, whose consistently rst-class publicity work over a period of any years is worthy of study and emula-on, has this to say about us: "Foresters s a class are prolific writers; they are lso as a class prone to shroud their houghts in technical terms and high-ounding language, both fatal to a popu-ar understanding." And he adds an im-ortant afterthought, "This is characteris-ic of the scientific mind."

No one, scanning the monthly flood of irculars, bulletins, and magazine articles manating from the pens of foresters, can ave any doubt of their apparent willing-ess to burst into print. Unfortunately, owever, much of this material never eaches any except foresters and special-zed groups interested in forestry and llied subjects. Aside from the work of ublicity men, many of whom are writ-ng without forestry training as a back-round, forestry copy is almost wholly in he class of the technical and the so-called emi-technical school of composition. In hort, it is neither prepared for nor does t reach the man in the street.

A veteran publicity man, with whom he present writer recently discussed this ondition, gave from his experience a rea-on which is interesting if true. Namely, hat scholars and scientists, adept at in-erpreting complex subjects in a form and tyle intelligible to highly trained intel-ects, experience considerably difficulty hen confronted with the necessity of explaining abstruse subjects in a manner acceptable to those with less education. If a comment is desirable, let me quote from Dr. Henry S. Canby, editor of *The Saturday Review of Literature:* "With the exception of first-rate discoveries of new fact, there is nothing more important at a moment when public opinion is mass opinion than the successful popularizing of what those who know, know to be true."

Lest the motives of the present writer be misunderstood, he hastens to explain that he is now considering publicity, and not literature, which are two distinct departments of creative literary effort. He makes no plea for a less substantial forestry literature, no lowering of the standards of erudition, no decrease in uncompromising works "of sound fact and reasoned opinion." The production of substantial works for substantial readers must continue. But as foresters, alive to the need for enlisting the support of a huge public that wants only news, easy reading, and popularized knowledge, we are simply neglecting a great opportunity if we do not recruit from our ranks writers able and willing to capitalize its interest by providing, not stale, second-hand, and frivolous soap-bubbles of fact and fancy, but knowledge simplified to the popular taste.

The present writer, who has been engaged in part-time publicity work for several years, has been both astonished and edified to find that the agencies apparently producing forestry copy most suitable for popular consumption throughout the country are the various state college extension services. Whether state college extension departments are able to hire the best publicity experts, or whether they simply devote more time and attention to this phase of education I am not prepared to say. But the fact is, they catch the popular fancy by attaining simplicity and clarity. The worth of their efforts is

reflected in an increasingly extensive application of forestry practice to the farm woodlots of America.

The National Park Service, as also, of course, the United States Forest Service, has been especially efficient in the production of live publicity, though one would naturally expect such large organizations to be leaders in any field. But there are small and relatively obscure organizations that have evidently studied publicity possibilities and then set out to capitalize them. One such is the Palisades Interstate Park Commission in New York. I have no idea who prepares the publicity material there, but anyone interested in developing the possibilities of publicity as a medium of education or for gaining public support would do well to study the excellent copy sent out from the headquarters of this park commission. The New York State College of Forestry at Syracuse University is another organization whose publicity possesses the dual merits of timeliness and popular interest.

Newspaper men are not all agreed upon the advantages of schools of journalism as producers of the best publicity writers. Although these schools expertly teach what may be called the trade aspects of this highly specialized job, it will be found upon investigation that many publicity men, or public relations counsel, to use the more elegant designation, have come up from the ranks in newspaper work. A considerable number have not even had that experience; they graduated into it by doing occasional publicity work as a side line. A certain flair and aptitude for the job, a broad back-ground of general reading, and ability to write intelligible English, and news sense appear to be the principal qualifications for a publicity man.

For some reason, not easily explained, the publicity man is often looked upon as a propagandist, which he is not. Publicity, which is commonly considered in its news sense is designed to promote some special project through the recognized media of the press, the magazines, and the radio. Not all publicity men devote their gifts and energies to indulging the public's curiosity concerning the loves, appetites, and gowns of movie stars. Governments, professions, religious bodies, organizations of all kinds furnish information for publicity purposes, and frequently their support, if not their existence, depends upon the amount of publicity they can receive. The fact that unworthy causes can and do use publicity for their own ends the same as worthy causes does not alter its fundamental value.

Professor Henry Schmitz has lately urged a new type of training that will fit forest school students for two distinct careers, the general forest practitioner and the specialist. Forestry in this country has had good publicity men in the past, although usually their publicity activities were incidental to, and only a part of, their routine administrative duties. But the scope of forestry is broadening so rapidly that publicity work is becoming a specialized, full time job. There are those who believe that these positions should be filled by foresters with the training and inclination which will fit them for publicity work, rather than by newspaper men with a forestry slant.

Wallace I. Hutchinson in a particularly able article on public relations in the April, 1931, issue of the JOURNAL OF FORESTRY, which deserved considerably more comment than it apparently received, made the statement that "many men in the forestry profession, government, state and private, seem to live and think in a background of ten to twenty or more years ago." As unflattering as such an assertion must be we cannot help but be convinced that it is fundamentally true.

Large public organizations, as well as

many noncommercial associations, when confronted with the necessity of explaining or defending themselves and their actions to the public, call together their publicity men, decide upon national or regional publicity campaigns and then carry them out as part of a progressive unified plan. Consider the tremendous strength and accomplishments of some of these publicity efforts, such as that of the Anti-Saloon League. Then consider in turn the spotty, sketchy efforts of the forestry profession to publicize the objectives to which the profession is committed. The explanation as to why our efforts often lack force and eventually fritter out is apparent.

It is the writer's opinion that a comprehensive publicity effort conducted on a nation-wide front over a period of several years could reverse public sentiment to the point where forest fires caused by smokers and campers, who are responsible for 30 per cent of the fires that burn annually in the United States, might be stamped out. So far, not only has there been no attempt made to bring together the nation's forestry publicity men who would be in a position to map out such a campaign and carry it on, but apparently no one has even thought of the idea. In the face of such inertia can anyone successfully challenge Hutchinson's suggestion that the forestry profession is apparently ten to twenty years behind the time?

There have been recent notable examples of what may be accomplished in the way of aggressive publicity. One of these is the Southern Forestry Educational Project conducted under the leadership of the American Forestry Association. Another is the George Washington Bicentennial tree planting campaign, sponsored by the American Tree Association. Even if, as some skeptical foresters suggest, the direct results of this project prove largely ephemeral, though the present writer is not prepared to admit it, the tremendous impetus given the reforestation movement in consequence of the publicity will be felt in America for many years to come.

Unfortunately for forestry, we do not have in our ranks outstanding publicity specialists such as Dr. Julius Klein of the United States Department of Commerce and David Lawrence of the *United States Daily*. But we do have good publicity men with the vision to conceive and the aggressiveness to carry out successful publicity campaigns. If we could harness these resources in men and brains and put them to work on some great endeavor to which the forestry profession is already committed, there would be less justification for the charge that the "greatest impetus to many forestry movements has come, not from the foresters themselves, but from outside individuals and organizations interested in conservation." Favorable mass opinion gained through public education is necessary to bring about the passage of important legislation and the solution of many pressing forestry problems. What could be more reasonable than to expect that the creation of this mass opinion should come from the forestry profession?

THE CHEMICAL CONTROL OF LUMBER AND LOG STAINING AND MOLDING FUNGI

By R. M. LINDGREN, T. C. SCHEFFER, and A. D. CHAPMAN[1]

U. S. Bureau of Plant Industry

Losses due to staining of the sapwood of lumber and logs are so heavy that any new discovery of methods to decrease them should command attention. Not only do the stains and molds depreciate the grade and value of the product but they cause overcutting of timber reserves to satisfy the demand for unblemished stock, and consequently overstocking of mill yards with low quality material. The authors investigated antiseptic chemical treatments to reduce the losses. They tried over 100 chemicals and found several to satisfy the requirements for lumber, among them organic mercury, and chlorinated and nonchlorinated phenol compounds and (for hardwoods) commercial borax, all greatly superior to past treatments and applicable to small as well as to large mill use. Treatment immediately after cutting is emphasized. Similar success was met with on logs.[2]

THE SAPWOOD of a number of commercially important species of pine and hardwoods when placed under certain conditions is subject to permanent discoloration caused by species of *Ceratostomella* and certain of the imperfect fungi. Such discolorations have been commonly termed blue stains or sap stains because of the color and the portion of the wood attacked. The stain occurs in spots, streaks, or patches, which vary in intensity of color and may penetrate part or all of the sapwood. Although in most cases a bluish hue is imparted to the affected wood, various shades of black, blue-gray, and grayish brown are encountered also, depending on the organism involved and the species and moisture condition of the wood.

Microscopically the stain fungi can be readily distinguished from decay organisms in wood by their larger and darker hyphae, which are confined principally to the parenchymatous tissues. Under certain conditions, however, the fibrous elements of the wood may be attacked, much in the manner of the decay fungi but not to the same degree.

In addition to the stain fungi, a number of molds, mainly of the Moniliales, cause discolorations of various hues which are largely superficial in nature and due to their fructifications rather than to the vegetative hyphae, but which are nevertheless considered objectionable on wood intended for certain purposes.

Economic Aspects

Discolorations produced in wood by stain and mold fungi are of importance as depreciating rather than as cull-producing factors. Losses result principally from reductions in grade, value, and marketability of the discolored material. Although stain does not alter materially the strength properties of the wood, it precludes its use or reduces its utility

[1] Respectively Assistant Pathologist and Agents, U. S. Bureau of Plant Industry, U. S. Department of Agriculture, in coöperation with the Southern Forest Experiment Station.

[2] Editor's Note.—The Editor is informed that all of the treatments described in this article can be used at effective concentrations at a cost of solution of from 10 to 12 cents per thousand feet. For large mills this would be practically the entire cost of the treatment since mechanical handling devices are available and therefore little labor is involved in dipping. For small mills, where mechanical dipping is not possible and the handling must be by hand, a labor charge of from 20 to 30 cents per thousand feet must be added. The organic mercury compound is available under a trade name and is made specifically for stain control purposes. The other compounds, as yet, have no trade names but can be obtained under the chemical names given.

value for purposes where an unblemished natural finish is desired. Since degrade results, to stain must be attributed some of the over-cutting of standing timber in an effort to replace and satisfy the demand for high-grade stock. To the mill, such over-production means an excessive accumulation of low quality material which is not always marketed readily.

Losses due to discolorations have been especially severe in the Gulf States and Lower Mississippi Valley region, where susceptible woods of great commercial importance are found, and where moisture and temperature conditions are conducive to the rapid development of fungi. In certain cases such losses have been unavoidable or the prevention of them would have required control practices which were impractical from the standpoint of cost. Often, however, they could have been prevented if improved methods involving little additional expense and only slight modifications in current handling practices had been available. The proper use of our forest resources demands that such preventable waste and loss be eliminated through the development and adoption of feasible methods of control. With the depletion of virgin stands of timber and the consequent necessity of utilizing second-growth timber containing a large proportion of susceptible sapwood, the problem of stain and mold control assumes increasing economic significance.

Stain Occurrence and Conditions Affecting It

The extent to which stored lumber and logs will be discolored is dependent on the susceptibility of the wood, the region under consideration, and the time and conditions of storage. Of the southern woods, the sapwoods of pines (*Pinus* spp.) and red gum (*Liquidambar styraciflua*) are particularly susceptible to discoloration while yellow poplar (*Liriodendron tulipifera*), magnolia (*Magnolia grandiflora*), black gum (*Nyssa sylvatica*), and the various species of oak (*Quercus* spp.) are less severely attacked.

Under favorable conditions of temperature and moisture, the staining organisms become established and develop rapidly in logs and lumber shortly after they are cut. In the case of lumber, infection may occur at any stage in the manufacture from the mill to the seasoning yard. Freshly cut stock that is piled during warm, wet weather or without ample ventilation at any time of the year may be noticeably discolored within 72 hours after sawing. Tests have shown that within 48 hours the stain organisms may become sufficiently established in the interior of the lumber to materially reduce the effectiveness of, and even render valueless under certain conditions, treatments applied after that time. Since moisture is the determining factor usually, the first few weeks after the lumber is piled constitute the critical period in stain occurrence. If conditions during this period are such that the lumber drys rapidly, little or no stain will develop; but if seasoning proceeds slowly, serious discoloration may occur. Stain development is prevented when the moisture content of the wood is reduced to approximately 20 per cent based on oven-dry weight.

In the case of logs, infection occurs usually at the ends or through barked areas along the sides. During warm, moist periods, logs left in contact with the ground and exposed to humid conditions for more than a week are visibly discolored at the ends. This stain may penetrate 12 to 18 inches within three weeks after cutting, and as far as 6 feet within three months. It is evident that such log infections must be eliminated if stain is to be controlled satisfactorily at the mill, since surface treatments can not be expected to remove stain already es-

tablished or inhibit further development in the interior of infected boards.

Although stain development in the Gulf States region is most severe during the summer months, there is no distinct season during which moisture and temperature conditions are so low that they become limiting factors. Lumber cut during December and January at mills as far north as central Arkansas has been found to be sufficiently stained after a storage period of 60 days to warrant some attempts at control.

Control of Stain

Stain in lumber can be controlled by treating the freshly cut lumber with antiseptic chemical solutions or by quickly reducing its moisture content below the point permitting growth of the discoloring fungi. Included in the latter method are such heat treatments as kiln drying and steaming, and the modified air seasoning practice of end-racking the lumber, all three of which attempt to promote rapid drying without undue injury to the lumber. While effective to a varying degree, these methods are comparatively expensive and at the present time are used to a limited extent in the small pine mills and hardwood industries. A number of antiseptic chemical solutions have been tried at various times, but no single treatment has been entirely satisfactory. Such treatments as 5 per cent solutions of soda (sodium carbonate or bicarbonate), which still are in commercial use, apparently have depended for their effectiveness on the neutralization of the acids in the wood and the establishment of alkaline conditions. These soda solutions have proved of little value on the hardwoods, and have not given consistently satisfactory results on pine.

In the case of logs, the prevention of stain and decay fungi during storage periods involves practices directed at utilizing the logs rapidly and producing conditions unfavorable for the deteriorating agents. Some of the control methods in use are storage of logs under water, treatment with antiseptic chemical sprays or end coatings, and rapid seasoning of the logs by piling on high skids, high ground or in the sun. As in the case of lumber, no inexpensive and consistently effective method of stain control has been available for use by the sawmill industry.

Of the several methods which lend themselves to improvement, the development of efficient chemical dips or sprays seemed to offer the greatest promise of yielding results which would have an immediate and widespread commercial application. With this end in view a number of chemical control experiments were started in 1928 in coöperation with the Forest Service, and with financial support by the American Pitch Pine Export Company, an association of lumber exporters operating under the Webb Act.

Experiments with Chemical Treatment on Lumber[3]

Preliminary Small-Scale Tests. Since it was obviously impossible to make tests on a commercial scale of the large number of chemicals warranting trial, preliminary small-scale tests were conducted as a means of eliminating all but the most effective chemicals. Fifteen series of such tests using a total of over 100 chemicals and combinations of chemicals were made from 1929 to 1931 at mills in all of the Gulf States.

In selecting the chemicals for trial and in evaluating them later for stain control such qualities as cost, ease of solution

[3] Details of the methods and results of both the small and large scale tests conducted through 1930 are available in the following article: The Prevention of Sap-Stain and Mold in Southern Woods by Chemical Treatment. *Southern Lumberman* 142:42-46. Illus. Feb. 1, 1931.

d application, effect on equipment and lor of lumber, and injuriousness to orkmen, were considered in addition to xicity to the stain fungi. Included in e group selected were a large number organic and inorganic salts of the avy and alkali metals and chlorinated d nonchlorinated phenol compounds. me of the materials had been used pre- ously in other fields of investigation, hers were proprietary compounds rec- mmended as stain preventives in the nited States and in foreign countries; e remainder were untried chemicals hich had shown promise in laboratory xicity tests on agar.

The experimental material consisted of eshly cut sapwood pieces of pine and hardwood, 2 by 2 by 24 inches in size. orty to 60 such pieces, constituting a st for one treatment, were immersed for 5 seconds in the solution and then osely cross-piled in a moist location here uniformly severe staining condi- ons were presented for all test piles. fter 30 to 60 days, the treated pieces ere examined and the relative amounts f surface and interior stain determined r the different treatments. Since most emicals received at least three separate ials at different mills, a fair basis was rnished for a comparison of the effec- veness of the treatments and the subse- uent elimination from further trial of e less effective ones.

The results of the small-scale tests were onsistent in that approximately the same lative degree of stain control was ob- ined for any one treatment throughout e several series of tests. The absolute mounts of stain and mold were not al- ays the same for any given treatment, ut this was to be expected since condi- ons for fungus development varied con- derably among the different tests.

Some of the chemicals were found to ontrol stain and mold in both pine and ardwoods; others prevented stain but not mold, or vice versa, or were limited in effectiveness to one kind of wood. Of the 100 or more chemicals tested, only 5 seemed to combine enough of the required qualities of a practical treatment to warrant selection, and accordingly were given commercial trial. These were ethyl mercury chloride and ethyl mercury phosphate on both pine and hardwoods; borax and sodium tetrachlorophenolate on hardwoods only; and sodium orthophenylphenolate on pine only. A sixth more recently tested compound, sodium 2-chloro-orthophenylphenolate, has given sufficiently promising results on both pine and hardwoods to warrant trial in any further commercial testing that is done. Several other chemicals, including ethyl mercury sulphate, ethyl mercury oxalate, sodium dinitrophenolate, and mercuric iodide plus potassium iodide, accomplished effective stain control but had to be eliminated from further consideration because they possessed one or more of the objectionable qualities of discoloring the wood, of being corrosive to equipment or of being injurious to workmen handling them.

Commercial Scale Tests. For the purpose of determining the relative value of the most effective treatments for commercial application, practical dipping tests were conducted in 1930 and 1931 at eight representative mills located in all of the Gulf States except Texas. The treatments used were: on pine—approximately 0.01 per cent solutions of ethyl mercury chloride and ethyl mercury phosphate, 0.37 per cent sodium orthophenylphenolate, 0.48 per cent sodium tetrachlorophenolate, and a 5 per cent solution of soda (mixture of carbonate and bicarbonate); on hardwoods—the ethyl mercury and sodium tetrachlorophenolate treatments mentioned above, and a 5 per cent solution of commercial borax.

In establishing these tests, regular mill run of lumber was used, and the cus-

tomary mill practices were followed whenever possible. Treatment was accomplished by conveying the lumber on chains through a vat containing the antiseptic solutions. (See Figure 1.) Immersion periods varied from 10 to 15 seconds, and the temperature of the solutions was kept either at air temperature or at 160° F. The treated lumber, together with untreated material for comparative purposes, was placed under uniform conditions of drying in air-seasoning piles. After a drying period of from 60 to 90 days the piles were dismantled and records taken of stain and mold occurrence.

Results and discussion. Several of the treatments accomplished efficient control of stain and in addition definitely reduced decay infections which originate in the lumber during the seasoning process. The two ethyl mercury preparations proved to be the most effective on both pine and hardwoods, the difference in the efficiency of the two being too slight to be significant. On hardwoods alone, the borax and sodium tetrachlorophenolate solutions gav control equal to that of the organic me cury compounds. All of these treatmen reduced stain in sap gum to an averag of less than 1 per cent of the sapwoo area, whereas the untreated lumber ave aged 51 per cent of its sapwood are stained. (See Figure 2.)

In the case of pine, sodium orth phenylphenolate and sodium tetrachlor phenolate were definitely superior to sod the principal treatment in current us but were slightly inferior to the eth mercury compounds. Although soda di not compare favorably with the oth treatments, the lumber treated with it wa appreciably brighter than the undippe control material.

These treatments seem to satisfy mo of the requirements of an efficient sta preventive with the possible exception o injury to workmen coming in conta with the treated lumber. They are fa superior to and have a wider applicatio than previous treatments and can be ap

Fig. 1.—Treating at large mills was accomplished by conveying the green lumber on chains through a vat containing the antiseptic solutions.

ed at the low cost of about 12 cents r thousand board feet of lumber or proximately three-fifths of a cent per 0 square feet of surface protected. One the ethyl mercury treatments has been nsidered of sufficient promise by over 0 millmen in the United States, Canada, exico, and the Philippine Islands to rrant adoption in their commercial actices. However, further work on cern problems relative to these treatments considered essential before any of them n be recommended definitely for comercial adoption and before their maxium efficiency can be assured. Some of ese problems are: the possibility of inry to workmen handling the treated lumber over long periods, the relative effectiveness of hot and cold solutions, the question of reduction in strength of the solutions during use, the extent to which severe weather conditions decrease their effectiveness and permanence. The possible extension of the use of dipping treatments to the small mills and concentration yards, production factors of increasing importance in the lumber industry, should be considered also.

ig. 2.—Typical boards from treated and uneated test piles of sap gum. Borax, sodium trachlorophenolate, and the organic mercury ompounds gave approximately equal control of stain on this wood.

Experiments with Chemical Treatments on Logs[4]

During 1930 and 1931, tests were made at a number of southern mills of approximately 60 different treatments of possible promise against stain and decay producing fungi and insects which attack stored hardwood logs. These treatments were applied either as entire log sprays directed at fungus and insect control, or as end coatings designed to control fungus development or to retard drying of the log and thereby reduce excessive checking. At each of the operations, the chemicals were tried in a preliminary way on sap gum bolts 4 feet long and 8 to 16 inches in diameter. Several of the most promising treatments were then used on logs of commercial size in order to compare certain treatments in current use with the most effective of the new ones, and to furnish information on cost and practical methods of application. The logs and bolts were treated immediately after cutting except for one series in which treatment was delayed three days. Since the conditions of storage and the type of log treated affect materially the results obtained, care was taken in selecting and locating the experimental material so that uniform conditions would be presented throughout. (See Figure 3.) After from 70 to 120 days of storage in

[4]For a detailed report see "Progress in the Use of Chemical Treatments to Protect Stored Logs om Deterioration." *American Lumberman*, No. 2926, pp. 46-48. June 13, 1931.

the woods, during which they usually lay on the ground, the bolts and logs were either split open or sawed and then examined for stain, decay, and insect occurrence.

Results and discussion. In general, the results were fairly consistent in that approximately the same relative degree of effectiveness of the chemicals was shown in the different test series. Where insects were not concerned, the following treatments controlled stain and decay fungi for a period of four months of winter storage and of from two to three months of summer storage: sodium tetrachlorophenolate, alone or in combination with pyridine; ethyl mercury chloride mixtures; creosote and kerosene; sodium 2-chloroorthophenylphenolate; and an end coating of cresylic acid and filled hardened gloss oil. Several of the treatments, including those containing creosote and pyridine, which had previously been tested alone by the U. S. Bureau of Entomology, definitely reduced the severity of insect attack, but none gave sufficiently consistent results to justify recommendation for commercial adoption without further trial. The need of immediate treatme for effective control was evident from th one test in which the application of th chemicals was delayed for three days. this case even the most effective trea ments failed to control appreciably su sequent deterioration.

Indications are that insect damage logs during the normal storage peri from November to March is not of suf cient importance to demand attempts control. If this proves to be the cas effective control of stain and decay du ing this period should be accomplish at a low cost by applying any one of th above mentioned treatments to the en and exposed places on the sides of th log. During summer storage, howeve some means of preventing insect dama will be necessary, since insects not on produce direct injury, but also carry an provide entrance for wood-inhabitin fungi.

Summary

The relative efficiency of over 1 chemicals in the control of stain ar

Fig. 3.—The experimental bolts and logs were stored under uniform conditions in the woods for a period of from 70 to 120 days.

old fungi which discolor wood has been udied on pine and hardwood lumber id logs. Most efficient control on lum-r was accomplished by several organic ercury and chlorinated and nonchlori-ated phenol compounds, and by commer-al borax, the latter on hardwoods only. hese treatments proved greatly superior past treatments, and offer promise of aving a wider field of usefulness.

On logs, most efficient control was given y spray solutions of chlorinated phenols, rganic mercury compounds, and creosote; and by an end coating consisting of cresylic acid and filled hardened gloss oil.

Although commercial adoption of some of the treatments has resulted, further work on certain problems relating to their use is considered essential before they can be recommended definitely. It is desirable also that the testing of promising new chemicals be continued with a view towards developing still more efficient and practical methods of controlling the deterioration of stored pine and hardwood lumber and logs.

"This is indeed the zero hour of forestry in Germany. Not only has the price of German wood suffered from the general world-wide depression, and the special competition of foreign woods, but of greater significance still is the fact that within the last decade German industry has been turning to steel, iron and cement as a substitute for wood in manufacture, construction and building. While this subtle change has been going on practically nothing has been done by foresters or others concerned to counteract it.

"It is indeed high time that the value of wood as a construction material be emphasized in such a way that there will be no longer any doubt in the minds of the German people, technical and non-technical, that wood has many qualities which make it pre-eminent as a raw material."

Translation by J. A. Cope in *The Timberman*, June, 1932, of a program announcing Berlin's 1932 *Grüne Woche.*

POLE UTILIZATION IN NEW ENGLAND

By GEORGE A. GARRATT

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Important changes in the wood species used for poles have been taking place in New England. The virtual extinction of the native chestnut by disease and the reduced supply of the local white cedars, along with changing demands for strength and other properties, have directed users to other woods. Western red cedar and southern pines are the newcomers. Preservative treatment is winning appreciation because of its ultimate economy.

IN THE EARLY development of the lines of many of the pole-using companies in the United States, availability and initial cost were apparently the determining factors in the choice of pole timbers. Any and all trees of suitable size, growing adjacent to the rights-of-way, were commonly used, with little or no regard for other possible service requirements. It was soon discovered, however, that many of the selected woods possessed no marked resistance to decay and, in consequence, their useful life was extremely short. For this reason, durability early became an outstanding requirement for pole timbers. Other prerequisites have been subsequently imposed, but the foregoing have been largely responsible for restricting the species of wood which are generally acceptable today. For many years about 80 per cent of all of the poles used in the United States have been cut from the several cedars (western red, northern or eastern white, and southern white) and from chestnut. The heavy demands placed on these few woods, not only for poles but for other uses as well, coupled with the ravaging of the chestnut by disease, have naturally resulted in a constantly decreasing supply and increasing cost. In consequence, other species, particularly the southern pines,[1] have assumed more and more importance as pole timbers. Cypress, Douglas fir, redwood, and oak also enter the pole market, but their present use i
limited and largely local.

Of late, as a result of civic and traffi
requirements, and other conditions, th
demand for wooden poles in certain sec
tions of the country has been affected t
some degree by an increase in the us
of steel poles and towers, iron and con
crete poles, and underground conduit
Overhead construction of this characte
is used largely on high voltage transmis
sion lines from hydroelectric plants t
consuming centers, and in cities for sus
pended trolley wires and ornamenta
street lighting. Underground conduit i
rather extensively used in congested busi
ness centers, where limited rights-of-wa
prohibit the use of poles, and wher
heavily concentrated loads warrant the ex
pense; it is also used to some extent i
the high-class residential sections of cer
tain cities, where overhead construction i
considered objectionable because of it
appearance. However, in New England a
least, there is no apparent tendency to
ward a marked increase in the use o
these newer forms of construction, excep
that the use of conduit may be expecte
to expand as urban areas increase. Unde
normal conditions the much less expen
sive wooden poles are preferred and, a
far as can be foreseen at the present time
they will continue to provide the grea
bulk of the demand as long as there is

[1]As far as the pole user is concerned, there is little or no discrimination between the differen species of southern pine providing the timbers meet the other imposed requirements as to size, form defects, etc. American Tentative Standards specifications state: "All poles shall be cut from liv southern pine timber: longleaf pine (*P. palustris*), shortleaf pine (*P. echinata*), loblolly pin (*P. taeda*), slash pine (*P. caribaea*), and pond pine (*P. rigida serotina*)."

fficient supply of satisfactory timber ailable at a reasonable price.

Until recently, New England has been ossessed of a supply of native chestnut *astanea dentata*) and eastern white dar (*Thuja occidentalis*) of sufficient agnitude to make the region self-sup-orting in the matter of its pole timber pply. Because of the distinct and sepa-te geographical distribution of the com-ercial supplies of these two species and eir past abundance, which made their se largely a local proposition with little r no transportation involved, their utiliza-on developed along sectional lines. hestnut early became the pole timber of outhern New England and eastern white edar that of the northern portion of the egion. The problems concerned with the resent and future timber supply of these vo sections are sufficiently distinct to arrant their consideration as separate nits.

Utilization of Pole Timber in Northern New England

The distribution of eastern white cedar n New England is largely restricted to he northern half of the region. It occurs n commercial quantities in the northern art of Maine, New Hampshire, and Ver-nont, and somewhat less abundantly in he central and southern sections of these tates. Except in the extreme southern ortion, which lies within the natural ange of the chestnut, the pole-using com-anies in northern New England have rawn almost exclusively on the local upplies of cedar in the past. The use of pruce has also been reported in certain estricted localities within the spruce belt, here durable timbers have not been vailable. This is notably the case on a umber of the farmers' lines operated by ome of the small telephone companies n the White Mountains and in certain ections of Vermont. Although such poles eteriorate rapidly, the supply of spruce has been plentiful along the lines in question, and maintenance has not been a burden to the operating companies, as the farmers could usually be depended upon to keep up the particular portions of the lines which served them. Limited amounts of western red cedar (*Thuja plicata*) and chestnut have also been used in northern New England in late years, and in a few instances southern pine has been utilized, but these woods have been used largely under special conditions, as where greater strength and longer poles have been desired.

Because of the heavy local demands that have been placed upon eastern white cedar, for railway ties and other products as well as for poles, the supply in the southern and central portions of its New England range has been largely exhausted. In the extreme northern part of the region, however, there still exists an abundant stand of pole stock, estimated by several companies as sufficient to meet the demands for the next 10 years, although even there the timber suitable for the larger poles has been greatly depleted. At the present time the supply is being supplemented by the extensive stands of eastern white cedar in the adjacent Provinces of Quebec and New Brunswick, and the majority of the pole-using companies operating in northern New England feel that they will be able to continue the use of this timber for the next 15 to 20 years at least. It is to be expected, however, that poles of the other species will be brought into the region in increasing amounts to fill the more exacting requirements of size and strength.

Although the eastern white cedar of New England and eastern Canada is botanically the same as the northern white cedar of the Lake States, there is generally a difference in the quality of the poles that come on the market from the two regions. This condition evidently results from different problems of distribu-

tion, rather than from any actual dissimilarity in quality of standing timber. In recent years, the distribution of northern white cedar poles from the Lake States has been seriously affected by the competition offered by western red cedar and southern pine and the producers have been led to raise their standards of quality, as expressed in their specifications. Closer limits have been established for butt rot, sweep, and twist and other changes in requirements have been made, with the objective of eliminating the causes for criticism which were encountered in trying to sell northern white cedar in competition with the other species.

The eastern white cedar poles, on the other hand, do not have the wide market distribution of the Lake States product and consequently they have not suffered so much from the competition of other timbers. For this reason, it is possible for the dealers distributing from this section to bring out and sell material which would not be acceptable under the northern white cedar standards. Production in this region is not organized to the extent that it is in the Lake States, being provided largely by small, scattered operators, often located at uneconomical distributing points and having limited financial resources.

Utilization of Pole Timber in Southern New England

Until rather recently, pole-using companies operating within the original commercial range of the chestnut, which embraces Connecticut, Rhode Island, Massachusetts, and the southern portions of New Hampshire and Vermont, found local stands of that timber entirely adequate for their needs. Even though the heavy demands made upon the chestnut, especially for such products as ties and lumber, made great inroads into the supply, there was little difficulty in obtaining satisfactory poles. The shortage was not felt for the simple reason that the rapid spread of the chestnut blight made it advisable to cut many of the remaining stands, that they might be utilized before they became infected or deteriorated too badly. Scattered stands of southern white cedar (*Chamaecyparis thyoides*), found near the coast in Massachusetts and Rhode Island, have also been drawn upon, but the restricted local supply of this material has always made it a very minor factor in the pole market. This particular species is usually classed with eastern white cedar and used as such.

By 1925 the situation, with respect to the native chestnut, had become acute. Not only were the local pole supplies largely inadequate for the demand, but the general quality of the material was not good, and the price was high enough so that other poles were often considered a better buy. By that time the supply for those companies which used a large number of poles annually, as well as those whose specifications were more exacting, was practically exhausted. The largest user of local chestnut in the region discontinued its use entirely after 1927, due to inability to obtain satisfactory poles.

At the present time, the use of poles of New England chestnut has been virtually abandoned. A few of the small companies, with less exacting requirements, are still apparently able to find a supply suitable for at least part of their needs, especially since the larger operators have withdrawn from the market. The quality of the remaining timber is becoming so inferior, however, that it is unlikely that even its small-scale use will be continued much longer. It is estimated by a number of users that the expected service life of the quality of chestnut now obtainable in New England is but from 5 to 8 years, a decided decrease from the normal life of from 12 to 15 years ascribed to sound timber. Some of the larger

ers are today paying the penalty, of eatly increased annual replacements, for ving depended too long upon the native od.

PORTATION OF POLES INTO SOUTHERN NEW ENGLAND

As it has become increasingly difficult obtain sufficient quantities of suitable tive chestnut poles, the operators in uthern New England have turned more d more to other regions and to other ods for their supplies. Some of them ve continued the use of chestnut by im- rtation from the Southern Appalachian gion, a practice which apparently be- n in a small way almost 20 years ago, rough the occasional placing of orders quiring prompt delivery of specific es. A marked increase in the use of s material has been in evidence since ount 1923, when several commercial ants were established in the South for eosoting the butts of poles. However, e stand of southern chestnut is now be- g ravaged by the same disease that has actically wiped out the New England pply. It is estimated that by 1935 nine- nths of the counties in the southern Ap- lachian chestnut ranges will have more an 80 per cent of their trees infected, d that within the next 10 or 15 years actically all of the virgin chestnut tim- r will be killed. While it is difficult to recast accurately the period over which estnut will still be available for poles this region, it seems probable that the uthern Appalachians will be effaced as important source of New England pole nber by as early as 1935. More and re blighted southern chestnut is mak- its appearance in southern New Eng- d and, as a result, some of the present nsumers are beginning to curtail the e of the wood; their unfortunate experi- ces with blight-killed New England ck has made them suspicious of all eased material.

The burden of furnishing a supply of suitable poles for southern New England will thus rest to an increasing extent upon eastern white cedar from northern New England and Canada, western red cedar from the Northwest and British Columbia, and southern pine from the South Atlantic and Gulf States. There is a feeling in some quarters that the supply of eastern white cedar is limited in certain sizes and that it cannot be considered an adequate source of supply for all the aerial conductor supports required by modern conditions. This is particularly true when the poles are to be used by more than one operating company (joint use). However, while it is a fact that the supply of these poles in the larger sizes is greatly depleted at the present time, they will still be available in the shorter lengths for some years to come. In this connection, one of the chief producers of such poles stated, in 1927: "It is a fact that the methods used in the past to bring out eastern white cedar poles in New England have not been adequate enough to secure a proper proportion of the longer sizes. However, the application of extensive logging methods to the production of these poles should be productive of a much larger quantity than heretofore. We are now using, and propose to increase the extent to which we use, such methods in procuring these longer lengths. We feel, therefore, that the market may look for an increase in the percentage of longer lengths being offered."

STATISTICS ON POLE UTILIZATION

In order to obtain some concrete information on the changing status of pole utilization in New England, an attempt was made to secure data on the subject for the years 1925 and 1930 from the majority of the pole-using companies in the region. Complete information was obtained from nineteen electric light and power companies and sixteen telephone

and telegraph companies, having a total pole-line mileage of approximately 54,000 miles. The list is fairly representative of both larger and smaller companies operating in both northern and southern New England and hence is considered to be reasonably indicative of the actual situation. The information obtained is summarized in the following table (Table 1).

TABLE 1

STATISTICS OF WOOD POLE CONSUMPTION FOR 35 NEW ENGLAND POLE-USING COMPANIES

	1925	1930
New England chestnut	37,103	6,147
Southern chestnut	42,767	57,965
Eastern white cedar	42,468	27,950
Western red cedar	5,658	23,650
Southern pine	20	21,853
Total	128,016	137,565

There are a number of significant facts indicated by Table 1. As late as 1925, the New England pole consumption was still dominated by chestnut and eastern white cedar, although a very large proportion of the chestnut was being imported from the Southern Appalachians; the use of western red cedar was being undertaken in more or less of an introductory fashion; southern pine was not yet a factor in the field. By 1930, the general abandonment of New England chestnut was quite evident and a marked decrease in the use of eastern white cedar was indicated. The falling off in the consumption of the latter wood, as shown in Table 1, is somewhat exaggerated, due to the abnormally large number of such poles reported by one of the companies in 1925; there was undoubtedly some decrease in the normal use of eastern white cedar, however, because of the difficulty of obtaining poles of all the sizes desired. Southern chestnut, western red cedar, and southern pine were all drawn upon in making up the deficit, the two last-named woods having firmly established themselves in the field by this time. The use of southern pine, although reported as mor or less experimental by a number of com panies in 1930, is considered especiall significant, as the tendency at presen (1932) is evidently toward a still furthe increase in the consumption of this woo

SELECTION OF SPECIES

The decision as to the kind of pole t use in a given territory is generally base on a thorough economic study, and th species that is expected to give the lowes ultimate (or annual) cost is usuall chosen. However, there are numerous in stances where other considerations, suc as municipal regulations, special con struction features, and the like, make necessary to deviate to some extent from the choice which would be made on strictly economic basis. In addition t initial cost and physical life, both c which are primary considerations in th determination of ultimate cost, such adde factors as relative strength, form, size an weight may have considerable influenc in the choice of one timber over anothe

The outstanding single factor which in fluences the physical life of a woode pole in service is the resistance which offers to deterioration by decay. Suc resistance is provided in two ways: (1 By the use of woods which are naturall durable, or those made artifically deca resistant by preservative treatment, an (2) by the use of poles whose origina ground line dimensions are sufficiently i excess of the replacement dimensions t allow for the experienced rates of deca It stands to reason that, within certai limits, the greater the resistance that th pole offers to decay, the less the exce dimensions need be.

The durability of untreated poles i chiefly dependent upon the kind and qua ity of wood used, but it may be mater ally affected by such local conditions a climate, soil, drainage, ground cover, et

s a result, there may be considerable ariation in the life of a given kind of ole, even within the same general secon, a condition which is reflected in the nformation obtained from various polesing companies in New England. Of the oods under consideration, eastern white edar apparently possesses the greatest atural durability, although chestnut and estern red cedar are both noted for heir resistance to decay. The experience f the pole-users in this region indicates hat the first-mentioned timber attains an verage life in service in southern New ngland of from 15 to 20 years, while in he northern half of the region it may xceed this. Native chestnut of good qualy is reported as having an average life f approximately from 12 to 15 years, lthough under certain conditions it may un as high as 20 years. However, the ew England chestnut obtainable at the resent time is much shorter lived, comanies which have had experience with his low quality material stating that such oles often fail in from 5 to 8 years. outhern chestnut and western red cedar ave not been used in this region long nough to give adequate service records, ut experience elsewhere under rather imilar conditions indicates that the duraility of these woods is about equal to hat of the better quality of local chestut. Because of their marked natural urability, poles of all the above-named pecies are still commonly used in the ntreated condition. But, in recent years, here has been a steady increase in the pplication of preservative treatment to he butts of such poles, in order to extend till further their physical life. Today the pen-tank treatment with creosote is so ommonly applied to the southern chestut, northern white cedar, and western ed cedar poles used in New England as o be regarded as the standard practice.

Unlike the above woods, southern pine s lacking in natural durability and is seldom used in New England unless treated with creosote for its entire length. When so treated, however, pine poles are extremely resistant to decay. While there is no data available to show the life which such poles may attain in this region, it seems likely that service record of at least 25 years may be expected, in the case of properly treated poles. A number of records of creosoted southern pine poles treated by the full-cell process show a life considerably in excess of this; the empty-cell process has been used for too short a period for the records to indicate definitely what life to expect.

While decay is the greatest single factor responsible for pole replacements, other causes combined may be the reason for upwards of 50 per cent of the total retirements. Among these causes may be listed fires, floods, ice storms, inadequacy, public requirements, civic improvements and other activities outside of the field of the pole-using companies, none of which are influenced to any material extent by the species of timber used. It is generally the aim in designing pole lines, at least in the communication field, to plan on a service life, as determined by pole removals from all causes, of approximately from 20 to 25 years. Since resistance to decay over such a period is normally to be expected from adequately treated poles of all the species being discussed, it is evident that under such conditions comparative durability is a factor of first importance in selecting pole species only when untreated or superficially treated material is under consideration. It is only when the expected life of a given pole line is materially in excess of the above figures, as it may be on private rights-of-way, that due consideration must be given to the probable differences in the decay-resistance of the thoroughly treated chestnut, cedar and pine.

The ever-increasing loads that are being imposed on modern poles, especially

in city distribution lines, have brought to the fore the importance of the strength requirement of such timbers. An important contributing factor to the present emphasis on this requirement is the increase in joint use of poles. Formerly practically all such members set in line were used exclusively by the company installing them, but since about 1910 the practice of having two or more sets of lines, such as electric light and telephone lines, strung on the same poles has developed to a marked degree. One of the largest companies in New England reports that at the present time almost two-thirds of its poles are in joint use. As regards the strength factor, the merit of southern pine is clearly established, although its superiority over chestnut and western red cedar in this respect is not so outstanding as to work to the deteriment of those woods for use under normal conditions. According to the recently approved American Standard strength values for wood poles, the ultimate fiber stresses assigned to chestnut and western red cedar are approximately 81 and 76 per cent, respectively, of the 7,400 pounds per square inch alloted to creosoted southern pine. Eastern white cedar, on the other hand, is often objected to on the grounds of its inferior strength, the assigned stress being slightly less than 50 per cent of that of southern pine. Poles of this species are considered by many of the operators in southern New England as undesirable for supporting heavy loads. The deficiency in strength of the eastern cedar may be overcome, of course, by the use of more sizeable poles, insofar as they are available, but this may lead to serious objections in cities on account of the sidewalk space taken up by the larger butts.

Aside from its bearing on transportation charges, and thus on delivery prices, weight has been regarded as a factor of some importance in the selection of poles, because of its relation to the erection and other handling costs of the sizeable timbers that are often used. The cedars, especially, have been favored in some quarters, due to their relatively light weight. However, many of the pole-using companies do not regard the greater weight of creosoted southern pine and chestnut as a serious drawback to the use of these woods, particularly in view of the mechanical handling devices, such as pole derricks, which are now coming into rather wide use. Furthermore, the present tendency appears to be toward the general use of somewhat smaller timbers, due to the increased fiber stresses recently assigned to all the species under consideration, except eastern white cedar.

Under conditions which require long poles, as is frequently the case in electric transmission lines and sometimes in city distribution and communication systems, the extensive use of eastern white cedar is precluded, since poles of this species are not generally available in quantity in lengths much over 35 feet. Western red cedar, on the other hand, can be procured in lengths not found in the other timbers under consideration. It is reported that poles of this species up to 115 feet long have been shipped from stock by some of the producers. Longleaf pine (*Pinus palustris*) is also available in extreme sizes, stock 80 feet long having been furnished by several producers. While the other southern pines and chestnut are seldom found in such lengths, there is no difficulty in obtaining these timbers in sizes suitable for all but the most extreme requirements.

Although the appearance of the pole may have little or no bearing on the actual service which it is capable of rendering, great importance is often attached to this matter in New England, especially in city lines, and in some cases it has apparently been the deciding factor in the selection of a given species. So important has this consideration become th

ore than one instance has been reported which a company has been compelled adopt an extensive program of underound construction largely because of isightly overhead pole lines. Appearice is a point decidedly in favor of estern red cedar, which is noted for the ccellent form and freedom from defects the timbers obtainable at the present me, and the resultant sightliness such bles give a line. These features are also nbodied to a large extent in southern ne. On the other hand, poles of eastern hite cedar, and chestnut to a lesser deee, are often decidedly crooked and ommonly contain knots and other defects hich may tend to make them undesirble for certain uses. In order to meet e strict requirements as to straightness nposed by some users and some municialities, there is a tendency among the roducers of chestnut and eastern cedar divide their stock, where necessary, ito two form classes: (1) Town (standrd) poles, in which the timbers are praccally as straight as the western red edar and southern pine used in New ngland, and (2) country (rural) poles, hich find wide distribution in rural comunities where appearance is not so imortant. In connection with appearance, onsideration sometimes has to be given local requirements for painting poles. n such cases, southern pine timbers reosoted for their entire length, may be t a disadvantage, if the natural dark rown to black color of the treated wood s not acceptable in lieu of painting.

Utilization of Treated Poles

It has been only within comparatively ecent years that the New England polesing companies, as a whole, have given erious consideration to the use of treated imber as a means of reducing the ultiate cost of their lines. The low initial ost of the naturally durable native chestnut and cedar, which were to be found in abundance in close proximity to practically all of the consuming points, gave no apparent justification for the added expense of preservative treatment in the earlier days. But, as the prices of the poles increased, with the rapidly decreasing supply of local timber and the constantly mounting transportation charges on material brought from greater and greater distances, the advisability of increasing the physical life of pole lines by utilizing treated timber became more and more apparent. Today there is an almost unanimous sentiment on the part of the consumers in favor of preservative treatment of one form or another.

When the demand for treated native chestnut and cedar poles was first created, however, it was found impossible to purchase them in New England, as there were no treating facilities available in the region. It was evident, therefore, to those companies which early became interested, that they would have to carry on their own treatments, if they were to be done at all. Confronted with this necessity, a number of operators began surface-treating the ground line of the local timbers by brushing with creosote, or various proprietary coal-tar derivatives. This method was apparently first used on poles in New England in 1903, but its real development did not begin until about 1916. Still later, a few of the operators substituted spraying for brushing. Both brushing and spraying have been widely utilized in this region, although in late years these surface treatments have been largely replaced by the more thorough open-tank treatments. In fact until 1922, when the first open-tank treating plant of any capacity was constructed in New England, brushing was practically the only method employed. The outstanding advantages which have given such wide appeal to the surface treatments are their simplicity and low cost and the rapidity with which they

can be carried on. The small amount of equipment needed and the ease with which it can be moved also render brushing and spraying suitable for field use, a consideration of decided importance in the past, when it was possible to purchase a large proportion of the poles locally and have them delivered at the hole without being assembled at a central pole yard. While brushing and spraying are necessarily superficial treatments at best, the results obtained when they are applied to the butts of well seasoned and carefully barked chestnut and cedar poles have been generally considered to more than justify the expense involved. Reports from a considerable number of companies indicate an increase in life of from three to five years under New England conditions. However, one of the criticisms of the surface treatments has been that they do not reach a satisfactory degree of effectiveness, except when restricted to poles which have received an appreciable amount of seasoning, and consequently they cannot be applied to the entire supply of companies having a large annual consumption.

Since 1922 a few operating companies have turned to the open-tank creosote treatment (hot and cold bath) of native chestnut and cedar poles. On adequately seasoned material this method is admittedly superior to brushing, giving the deepest penetration of preservative and consequently the greatest increase in life of any of the non-pressure treatments commonly applied to the butts of naturally durable poles. However, it involves considerable outlay for equipment, which must be permanently installed in one place. The expense of installing and operating such a plant limits its use to the companies which distribute a large number of poles, principally from permanently located yards.

Both the surface and open-tank treatments are confined to the butts of chestnut and cedar poles, being applied to a height of approximately one foot above the ground line. The natural durability of these woods provides a life in the untreated tops at least equal to that of the treated portion which is in contact with the ground.

With the increasing demands for treated cedar and chestnut poles, especially on the part of the smaller operating companies which were not in a position to carry on the more thorough treatment themselves, some of the large dealers have undertaken the work. They have installed butt-treating (open-tank) plants at concentration points along the rail lines to the centers of distribution, usually so located in reference to the shipping and receiving points that advantage can be taken of the "treating-in-transit" privilege of freight rates, thus reducing transportation charges materially. One such commercial plant has been installed in New England, for treating eastern white cedar poles; other plants supplying New England consumers are located in the South (for southern chestnut) and Lake States (for western red and northern white cedars). The western red cedar dealers were the first to offer open-tank treated stock to the New England pole-using companies and since about 1916 creosoted poles of this species have been purchased in increasing numbers. In 1923 facilities were installed for treating southern chestnut and since 1926 it has been possible to purchase tank-treated native eastern white cedar. Treated New England chestnut, on the other hand, has never been available on the general market.

A large proportion of the western red cedar poles being imported into New England have been perforated or incised over a three foot ground-line section prior to the hot and cold bath, and are sold on the basis of a guaranteed three-eighths inch or one-half inch penetration. A similar treatment is given to many

the eastern white cedar poles. Opinions as to the value of perforating the timber prior to the hot and cold bath are somewhat at variance, although it is generally conceded that the preliminary treatment affords a more uniform penetration and a greater concentration of creosote at the ground line than are secured with non-perforated stock.

Statistics as to the actual increase in the life of creosoted (hot and cold bath) chestnut and cedar poles are not available, as this material has not been used in the region for a sufficient period of time to give precise data as to its longevity under New England conditions. A number of companies using such butt-treated material anticipate an increase of from 5 to 10 years and in the opinion of the author these figures are conservative, where the work has been thoroughly done and the poles are set under favorable conditions. The producers generally claim an increase of from 10 to 15 years. As with all preservative treatments, a wide variation in durability is to be expected, even within the same kind of timber and under the same conditions of service, according to the amount and quality of the creosote used, the thoroughness of treatment and the condition of the timber at the time of treatment.

Creosoted southern pine poles, pressure-treated for their entire length to insure long life in the tops as well as the butts, have been available to New England operators for a long time, but it has been only since 1925 that they have been used to any appreciable extent. The outstanding objection to their use, aside from any past price factor, has been the tendency of these poles to "bleed" during hot weather, the exuding creosote making handling and line work difficult, and causing injury to clothing coming in contact with it, although the latter factor is often over-emphasized and has no bearing on poles used on private rights-of-way. However, "bleeding" has been greatly minimized in the modern treating practice, using specially selected grades of pure creosote oil on properly seasoned poles. A number of operators report that creosoted southern pine is being used under practically all conditions with general satisfaction. It is interesting to note that objections to such poles, on the score of their tendency to exude creosote, are much more prevalent in New England, where they are just being introduced, than in other sections of the country, where they have been used for years and are regarded as standard equipment.

Much attention is being devoted at the present time to the use of Montan wax in the treatment of southern pine poles. This wax, a non-toxic derivative of lignite, is injected into the wood in mixture with creosote and hardens on cooling to act as a seal in preventing the escape of the oil. The efficiency of this treatment is being shown at the present time in New England, where Montan-treated poles in actual service are reported to reveal no trace of "bleeding," either in the earth or above the ground line. A number of electric light and power companies in the region are now using Montan-treated stock in thickly settled districts, where people are likely to come into contact with the poles. Objections to the treatment are the cost, which is somewhat higher than for creosoting, and the fact that the wax tends to leave the timbers somewhat slippery and difficult to climb, although the latter objection is overcome by the use of steps on the poles.

The most recent development in the preservative treatment of southern pine poles has involved the use of zinc meta-arsenite (Z M A), a practically colorless chemical which is injected into the wood under pressure. Some Z M A-treated timbers have been installed in a number of New England pole lines during the past few years, under conditions where it was

considered necessary to have absolutely dry poles, or where they had to be painted, as is required in some localities. However, the use of such poles appears to have been largely abandoned by the telephone and telegraph companies in New England during the past year, although they are still being installed by some of the electric light and power companies.

Today those companies which have not installed their own treating plants are not limited to the use of untreated or surface-treated poles, except as they are continuing the use of local chestnut, but are in a position to draw upon open-tank treated eastern white cedar, western red cedar, and southern chestnut, and upon pressure-treated southern pine. The extent to which this selection is being made is indicated in Table 2, which gives statistics on the use of treated and untreated poles during the years 1925 and 1930, for the 35 New England pole-using companies previously mentioned. It is interesting to note, at this point, that the recent decrease in the use of Z M A-treated southern pine is being reflected, in the early part of 1932, by an evident increase in the use of southern chestnut.

TABLE 2

CONSUMPTION OF UNTREATED AND TREATED POLES BY 35 NEW ENGLAND POLE-USING COMPANIES

	1925	1930
New England chestnut:		
Untreated	11,361	3,168
Surface-treated	6,008	2,979
Open-tank-treated	19,734	—
Southern chestnut:		
Untreated	5,721	4,866
Surface-treated	29,153	578
Open-tank-treated	7,893	52,522
Eastern white cedar:		
Untreated	8,809	11,577
Surface-treated	24,265	300
Open-tank-treated	9,394	16,069
Western red cedar:		
Untreated	595	509
Surface-treated	—	—
Open-tank-treated	5,063	23,143
Southern pine:		
Untreated	20	—
Pressure-treated:		
Creosote	—	13,238
Montan wax-creosote	—	5,244
Zinc meta-arsenite	—	3,37[illegible]

ECONOMIC CONSIDERATIONS

The initial costs of the treated poles available in New England vary over fairly wide limits and depend not only on the kind or species of timber, the specifications under which it is purchased, and the method of treatment, but, as a result of often pronounced differences in transportation charges, upon the point of consumption as well. In addition, the prices of any given kind of pole may fluctuate markedly within comparatively short periods of time, as the production and treating charges fluctuate with changes in costs of labor and preservatives and with other factors. As a result, it is impossible to derive any single set of cost figures which would be applicable to the entire region today, or even to a comparatively small section for any period of time.

It must be borne in mind that, while low first cost is much sought after and may be the prime consideration for temporary pole lines, it is by no means the yardstick by which poles should be selected for permanent construction. Rather the choice between untreated and treated poles, and between brushing or spraying and the more thorough treatments, should be made on the basis of the ultimate cost of the timbers in service, as determined by the annual charges levied against them from the time of their installation to their retirement.

To the initial cost of the pole must be added the cost of installation (or replacement), which, under present day conditions, may greatly exceed the former charge. This is particularly true on high voltage transmission systems, where replacements may involve serious and often expensive interference in the continuous operation of the lines, and in city distribution, where the costs of transferring wires and other equipment are frequently

excessive. One of the largest operators in New England figures the *average* cost of 35-foot treated poles in line at $37.00 each. Of this amount, $13.50 represents the cost of the pole delivered in the distributing yard, and is the greatest single expenditure is the cost of erection. The total cost of the pole in service, together with the necessary interest charges, is distributed over the estimated life of the timber, to compute the annual cost. Of the three main factors involved—initial cost, installation (or replacement) charge, and physical life—it is only the last-named over which the operator has any appreciable measure of control in the selection of poles.

The actual cost of treatment constitutes only a small percentage of the total cost of a pole in line, roughly estimated at from about 7 to 12 per cent for the more thorough treatments. And it has been repeatedly demonstrated, under the service conditions which prevail today, that the pronounced increase in life, obtained through the open-tank treatment of chestnut and cedar and the pressure treatment of southern pine, is responsible for a material reduction in the annual charges assigned to untreated poles of the same species. Even the superfically surface-treated chestnut and cedar have been found to be consistently more economical than the untreated stock.

Conclusion

It has not been the purpose of this paper to make any sweeping recommendations in favor of the exclusive utilization of any one pole species throughout New England. The conditions of use are far too varied for that. Rather it has been the intention to consider as impartially as possible some of the advantages and disadvantages of the different species, and to emphasize the importance of preservative treatment in reducing the ultimate cost of poles.

During the past ten years there has been a marked increase in the use of southern chestnut and western red cedar and, since 1925, of southern pine. This is particularly true in southern New England, where the virtual extinction of the native chestnut has made necessary the extensive importation of other pole timbers. Unquestionably the period of time over which southern chestnut can be depended upon to supply any large demand is limited by the chestnut blight, but this timber will continue to be a factor in the pole market for a few years at least. The supply of western red cedar and southern pine, on the other hand, is much more stable and one or the other of these woods, if not both, will undoubtedly dominate the New England pole market before many years have lapsed. In northern New England these two woods are being used to some extent, although mostly under special conditions, for which the native cedar is too poorly suited; in southern New England both of these timbers have been found well adapted to general, as well as specialized, use. Eastern white cedar seems destined to play a minor role in southern New England, particularly in electric light and power line construction, although in the northern part of the region it will probably be extensively used as long as an adequate supply is available.

Today there is an almost unanimous appreciation, among New England pole users, of the economy afforded by the use of satisfactorily treated timbers. Adequate physical life, rather than low initial cost, is generally regarded as the major consideration in the selection of otherwise suitable pole stock. With the largest operators at least, the thorough open-tank treatment of southern chestnut and the cedars and the pressure treatment of southern pine have come to be regarded as standard requirements for the use of these woods.

WOODS AND MILL UTILIZATION IN NORTHERN IDAHO AND WESTERN MONTANA

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Twenty per cent of the average western white pine tree of the Inland Empire is not utilized; for western yellow pine the loss is 23 per cent; for larch 31 per cent and for Douglas fir 22 per cent. Details accounting for the loss are shown graphically in four charts, the data for which were obtained from a mill study of 22,000 logs and a woods study of 7,000 trees.

IN 1927 the Section of Forest Products of the Northern Rocky Mountain Forest Experiment Station completed a comprehensive mill scale study. Detailed utilization data were obtained at eight representative mills of the Inland Empire[1] on 22,000 individual logs having a net log scale of 2,631,400 feet board measure. Immediately following the completion of this study a series of woods utilization studies were inaugurated. To date the work has covered such subjects as residual wood after logging in all commercial types of the Inland Empire, breakage loss in felling and log depreciation in gravity chuting. Studies contemplated are: the economic feasibility of long-butting the pines, bucking pine logs for grade and size of lumber, and depreciation and loss in bug infested timber.

Some of the results of these two major investigations are shown graphically in a series of charts presented in this article. They depict the woods and mill utilization of the average tree of four of the most important commercial trees of the Inland Empire. These species are western white pine (*Pinus monticola*), western yellow pine (*Pinus ponderosa*), western larch (*Larix occidentalis*), and Rocky Mountain Douglas fir (*Pseudotsuga taxifolia*).

In the following paragraphs wood losses have been invariably expressed in cubic feet. Non-merchantable wood losses particularly should never be expressed as board measure because such figures are very misleading and usually without meaning. To do so would be analogous to selling hogged fuel or sawdust on a board-foot basis instead of a unit of 200 cubic feet or some similar cubic unit.

Utilization of Western White Pine

This species is the most important commercial lumber tree of the Inland Empire. Woods and mill losses in the white pine region are held to a minimum. Compared to identical wood losses in other regions, woods and mill utilization in the white pine type of North Idaho is undoubtedly of the highest standard west of the Rocky Mountains. In spite of that fact, a considerable amount of the wood in the average white pine tree is lost in the process of conversion from tree to lumber.

Figure 1 presents the present day normal woods and mill utilization of the average western white pine tree. This chart is based upon the cubic volume of the average white pine tree logged during 1929 and 1930 in North Idaho. This cubic volume includes tree volume less

[1]The Inland Empire is the forested area in Montana, west of the Continental Divide, Idaho north of the Salmon River, and that portion of eastern Washington and Oregon tributary to Spokane, Washington.

e bark from the ground line to a point our inches in top diameter. Actually nly 102 feet of merchantable length to n average top diameter inside the bark f 9.2 inches are removed from the woods n the form of sawlogs. This sawlog volme amounts to 92 per cent of the total ubic volume of the tree from the ground ne to a top diameter inside bark of 4 nches. This material is removed from the oods in the form of merchantable sawogs or left in the woods as cull logs oo defective for manufacture into lumer. Of the other 8 per cent left in the oods 3.2 per cent is wasted in the form f merchantable breakage. At the present me it is not known how much of this .2 per cent is unavoidable, but casual bservation indicates that a portion of t can be avoided. In addition to this reakage loss, one-half of one per cent f the tree is left in the stump in the orm of merchantable material and 0.8 er cent of the tree is left in the form of mooth and straight material in tops. Of he sawlogs taken out of the woods 62.5 er cent of their cubic contents goes into umber while the remaining 35.5 per cent oes into by-products and absolute waste, s indicated on the chart. The absolute aste, or 13 per cent of the cubic conents of the sawlogs, goes to the burner. awdust and hogged fuel used as mill uel are not considered as waste; nor re slabs, edgings and trims utilized for ath moulding, short box and commercial uel classed as waste. Thus, 13 per cent f 92 per cent (the portion of the tree onverted to sawlogs) or 12 per cent f the tree is not utilized in the mill. This waste of 13 per cent in the mill lus the material left in the woods gives total of 20 per cent of the average hite pine tree not utilized in any form.

During the normal year approximately 24,040 acres of the white pine type are ut over in the Inland Empire. This cutver area yields 424 million board feet net log scale of white pine. For every 1,000 feet (net) logged 35 feet (net) or merchantable white pine sawlog material remains in the woods unutilized. Thus the regional logging loss of this class of material amounts to 15 million board feet of white pine annually. Contrasted to the amount removed and the conditions under which it is moved, this merchantable loss is not excessive. There is also an additional wood loss in logging composed of material of no commercial value consisting of stumps, breakage and tops. For every 1,000 board feet (net) logged 25 cubic feet (theoretically equivalent to 150 board feet) of non-merchantable white pine tree wood remains in the woods unused. Thus the total logging loss of both merchantable and non-merchantable white pine tree wood amounts to 32 cubic feet for every 1,000 feet of white pine logged. Since there are 424 million board feet of white pine logged annually, the annual wood loss in logging this species amounts to approximately 13 million cubic feet. This combined with losses in milling makes a total woods and mill loss of 22 million cubic feet of white pine tree wood annually in the Inland Empire. Losses in milling do not include wood material used in mill and domestic fuel, lath, moulding and short box.

Utilization of Western Yellow Pine

This species ranks second in importance as a commercial lumber tree in the Inland Empire.

Figure 2 presents the present day normal woods and mill utilization of the average western yellow pine tree. The cubic volume of a 23-inch western yellow pine tree (the size of the average tree logged at the present time) from the ground line to a point at the top of the tree 4 inches in diameter inside the bark, as well as limbs containing a piece of wood 4 feet long with a middle diameter

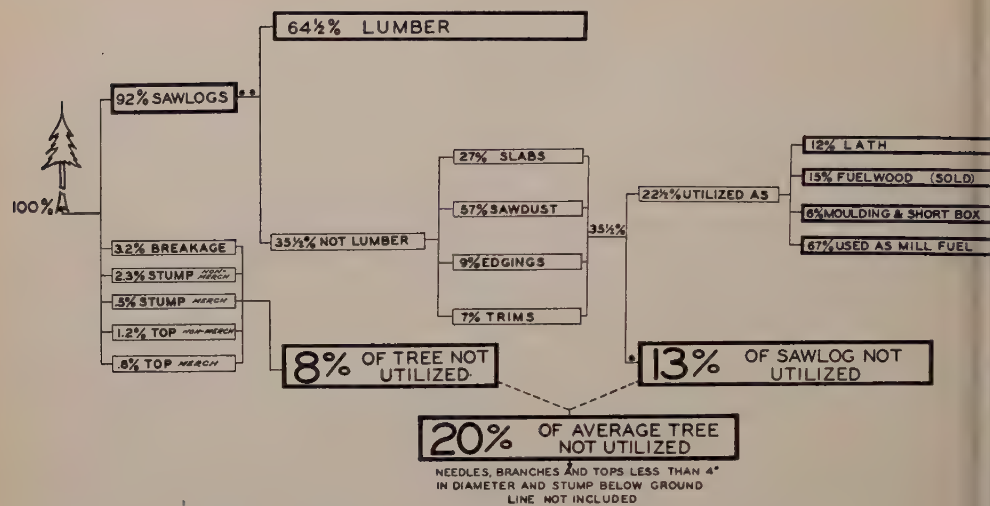

Fig. 1.—Utilization of the average western white pine tree.

The average western white pine tree logged in north Idaho is 23" in diameter breast high.

* This indicates 13 per cent of sawlogs are absolute waste in mill—not 13 per cent of entire tree—12 per cent of tree (13 per cent × 92 per cent) is absolute waste in mill.

** Based on mill utilization in 1925.

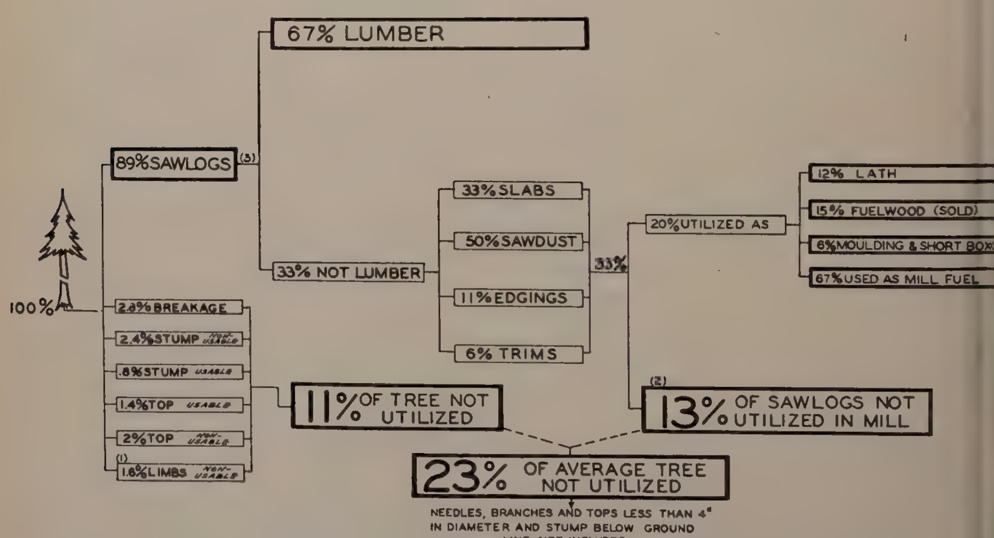

Fig. 2.—Utilization of the average western yellow pine tree.

The average western yellow pine tree logged in north Idaho and western Montana is 23" in diameter breast high.

(1) Includes limbwood of minimum dimensions of 4" middle diameter outside bark and 4 feet in length.

(2) This indicates 13 per cent of sawlogs are absolute waste in mill—not 13 per cent of entire tree—12 per cent (13 per cent × 89 per cent) is absolute waste in mill.

(3) Based on mill utilization in 1925.

of 4 inches in diameter outside the bark, was used as a base (100 per cent) for the chart. A study of this chart indicates that 89 per cent of this cubic volume is removed from the woods in the form of sawlogs or left in the woods as cull logs too defective for manufacture into lumber. Of the 11 per cent left in the woods 2.8 per cent is lost in the form of merchantable breakage. At the present time it is not known how much of this 2.8 per cent is unavoidable, but casual observation indicates that a portion of it can be avoided. In addition to this breakage loss, eight-tenths of one per cent of the tree is left in the stump in the form of usable material and 1.4 per cent of the tree is left in the form of smooth and straight material in tops. Of the sawlogs taken out of the woods 67 per cent of their cubic contents goes into lumber while the remaining 33 per cent goes into by-products and absolute waste, as indicated on the chart.

During the normal year approximately 25,100 acres of the western yellow pine type are cut over in north Idaho and western Montana, a little more than the annual cutover area of the entire western white pine type (24,040 acres). These 25,100 acres of western yellow pine forest cut over annually produce 289 million feet of yellow pine sawlogs. For every 1,000 feet (net) logged 63 cubic feet (theoretically equivalent to 378 board feet) of merchantable and non-merchantable yellow pine wood remains in the woods unutilized. Thus the total yellow pine wood loss in logging in north Idaho and western Montana amounts to approximately 18 million cubic feet annually. This is considerably more than the wood loss in logging in the white pine region, which amounts to 13 million cubic feet. This greater wood loss in logging yellow pine is due to different utilization practices. The average white pine stump in the region is 14.5 inches in height compared to 15.2 inches for yellow pine. White pine trees are utilized to top diameters of 6 to 12 inches or an average of 9 inches, compared to yellow pine trees which are utilized to 7 to 16 inches or an average of 12 inches. Western white pine also contains a negligible amount of limb wood, which is quite plentiful in overmature yellow pine stands. These differences necessarily result in more of the average yellow pine tree's being left in the woods than is left of the average white pine tree. Wood losses in milling are less for yellow pine than for white pine—principally because of less remanufacture and less refined practices on the headsaw, edger and trimmer. More thick stock is also cut from yellow pine, thereby eliminating some of the saw kerf loss. The annual absolute yellow pine wood loss of mills operating in north Idaho and western Montana amounts to 6.5 million cubic feet. This combined with the logging loss of 18 million cubic feet makes a total wood loss of 24.5 million cubic feet. Losses in milling do not include wood material used for mill and domestic fuel, lath, moulding and short box.

Utilization of Western Larch and Rocky Mountain Douglas Fir

While these two species are considered weed trees when logged in mixture with white pine and yellow pine, they are the primary species for numerous operators in the Kalispell region of western Montana.

Figures 3 and 4 show the woods and mill utilization of the average western larch and Douglas fir tree. The bases for all figures used on these charts are shown in footnotes on each chart. Some comparisons between larch and Douglas fir are interesting. Figure 3 shows that 7.9 per cent of the average larch tree is lost in long butts, contrasted to a negligible loss of this kind for Douglas fir.

Loss from breakage and in stump material is also greater in larch. This along with the long-butt loss decreases the sawlog volume that may be removed from the woods. As it is, the larch sawlog volume removed from the woods is only 79 per cent of the tree compared to 90 per cent for Douglas fir, 92 per cent for western white pine, and 89 per cent for western yellow pine. Practically all of this wood lost in long butts is unfitted for lumber production, and its utilization or lack of utilization constitutes a challenge to all foresters. Wood loss in larch butts contributes practically as much to wood losses in logging as the combined breakage and stump volume of the tree. Breakage losses are, however, more serious from the lumberman's standpoint, since breakage volume usually contains excellent material for lumber manufacture. The total woods loss of both usable and nonusable wood for the average larch tree logged is 21 per cent of the cubic contents of the tree, compared to 10 per cent for Douglas fir, 8 per cent for western white pine, and 11 per cent for western yellow pine.

Utilization of larch and Douglas fir in the sawmill is even better than the pines if actual cubic volume of sawlogs converted to lumber is used as a comparison. Seventy-two (72) per cent of the cubic contents of the larch sawlogs in the average tree brought into the mill is converted into lumber, compared to 71 per cent for Douglas fir, 64.5 per cent for western white pine and 67 per cent for western yellow pine. The fact that a large percentage of larch and Douglas

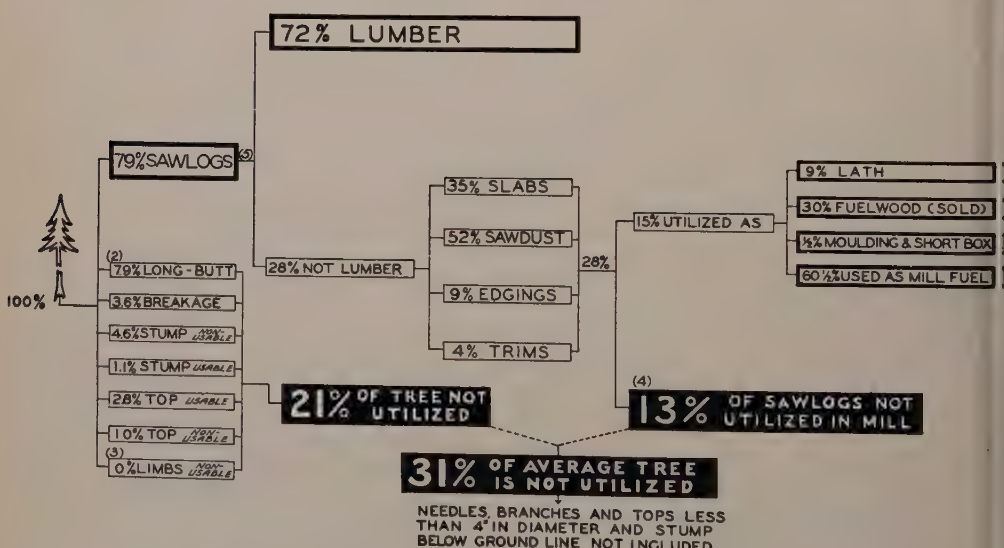

Fig. 3.—Utilization of the average (1) western larch tree.

The average western larch tree logged in northern Idaho and western Montana is 22" in diameter breast high.

(1) Limited to logging and milling operations located in western Montana, northern Idaho and eastern Washington. Does not include portable sawmill operations.

(2) Very few operators long-butt douglas fir, but larch is universally long-butted.

(3) No limbwood recorded smaller than a stick measuring 4" in middle diameter outside bark and 4 feet in length.

(4) This indicates 13 per cent of sawlogs are absolute waste in mill—not 13 per cent of entire tree——10 per cent (13 per cent × 79 per cent) is absolute waste in mill.

(5) Based on mill utilization in 1925 and utilization in the woods in 1930.

fir logs are cut into dimension material and ties results in this favorable showing for these two species. Those portions of the sawlogs not made into lumber in the mill may be classed as by-products and absolute waste. The absolute waste, as indicated by the chart, amounts to 13 per cent for both larch and Douglas fir. This wood loss in the mill is greater than the wood loss in logging for all species except larch. The latter loss amounts to 21 per cent for the average western larch tree, compared to a milling loss of 10 per cent. Thus it is evident that combined woods and mill losses for larch are tremendous.

From time to time attempts at chemical utilization of wood unfitted for lumber have been made. As yet none have been especially successful in this region. A few years ago an effort was made to utilize larch long-butts for galactan, a water soluble substance used in the manufacture of baking powder, effervescent drinks and pharmaceutical preparations. Before any enterprise of this nature is started it is well to inventory the raw material. During the normal year it is estimated that from 8,000 to 10,000 cords of larch long-butt material are left in the woods mostly tributary to the Great Northern Railway in northwestern Montana. Some of this material is, of course, subsequently used for fuelwood, so it is not wasted. Material in stumps is also available for galactan extraction. By cutting stumps reasonably sound except for shake and check to an average height of 7 inches, an additional 5,000 cords could be secured from this same territory.

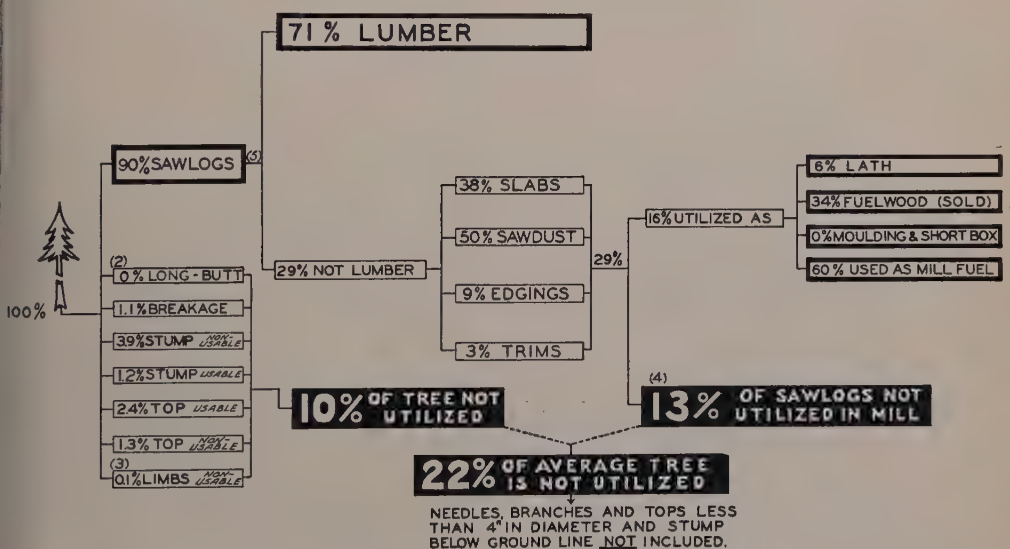

Fig. 4.—Utilization of the average (1) Douglas fir tree.

The average Douglas fir tree logged in northern Idaho and western Montana is 20″ in diameter breast high.

(1) Limited to logging and milling operations located in western Montana, northern Idaho and eastern Washington. Does not include portable sawmill operations.

(2) Very few operators long-butt Douglas fir, but larch is universally long-butted.

(3) No limbwood recorded smaller than a stick measuring 4″ in middle diameter outside bark and 4 feet in length.

(4) This indicates 13 per cent of sawlogs are absolute waste in mill—not 13 per cent of entire tree —12 per cent (13 per cent × 90 per cent) is absolute waste in mill.

(5) Based on mill utilization in 1925 and utilization in the woods in 1930.

During the normal year, approximately 12,000 acres of the larch-Douglas fir type are cut over in Montana, not quite half the area logged in either the white pine or yellow pine types. On the average acre logged there is a combined merchantable and non-merchantable wood loss of 480 cubic feet for larch and 216 cubic feet for Douglas fir, or a combined loss of 696 cubic feet. Then the total combined logging and milling wood loss of larch and fir in this type amounts to approximately 8.5 million cubic feet.

In conclusion it is interesting to summarize the total amount of non-merchantable and merchantable wood lost in converting western white pine, western yellow pine, western larch and Rocky Mountain Douglas fir from trees to lumber and timbers. The aggregate loss in logging and milling amounts to 55 million cubic feet annually. Each year the wood losses encountered in logging and milling these four species would pave the Northern Pacific Railway tracks between the rails with blocks of one cubic foot each from Chicago to Seattle. This loss, large as it seems, is exceeded by the wood losses of the Douglas fir type on the west slope of the Cascades. Here the annual wood loss of Douglas fir alone amounts to approximately 240 million cubic feet, an amount sufficient to pave several more transcontinental railways.

"Like agriculture, forestry is concerned in the use of the soil for crop production; as the agriculturist is engaged in the production of food-crops, so the forester is engaged in the production of wood-crops, and finally both are carrying on their art for the practical purpose of a revenue.

"Forest crop production is the business of the professional forester."

Economics of Forestry, Bernhard E. Fernow. 1902.

BREAKAGE AND DEFECT VOLUME LOSSES IN A PONDEROSA PINE STAND

By CLARK MILES

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A change from log scale to tree measurement in timber sales requires an appraisal of possible losses due to breakage and defects, both visible and invisible. This paper presents the result of a study of losses occurring in a stand over three-fourths of which was ponderosa pine and the remainder Douglas fir and lowland white fir on the Payette National Forest. Contrasts between species, between defects within a species, and avoidable and unavoidable losses are brought out.

TO EFFECT SAVINGS in time and expense, the practice of making timber sales by tree measurement rather than by log scale, is becoming standard practice in the Intermountain Region of the Forest Service, especially for small sales. This has necessitated the careful checking of existing volume tables and the compilation of new ones, and has called for careful study of the question of losses such as are due to breakage and defect, in order that accurate scale may be made of tree volumes.

For these purposes a study was conducted last season on the Payette National Forest, on a typical ponderosa pine logging operation on the Cascade Working Circle. Detailed data were obtained from measurements of 630 trees of various species scaling 508,000 feet board measure. Study of these data combined with analysis of scale records for the compartment of 200,165 logs scaling 39,542,000 feet board measure, and detailed marking records for the compartment, has given the information here reported.

Losses in Ponderosa Pine Stands

Losses are of various kinds as explained later and are noted in two main operations as follows:

Marking timber. In marking, unmerchantable trees are marked for girdling and we have these losses to consider.

Scaling logs. (1) Marketed material. Logs from merchantable trees have many defects for which deductions are made in scaling. (2) Material left in the woods. In addition to the losses on material brought in from the operation, we have losses on material left in the woods such as cull logs, broken material, and small logs, cull or otherwise which might be left.

Marking

In Table 1, is indicated the average marking on the Beaver Creek compartment, an area of 2,428 acres. It includes all trees of merchantable size, i. e., of 10 inch and greater d. b.h. and containing one or more logs. It gives one a good idea of the average marking on large sales in ponderosa pine. In marking, no stands of mixed species (species other than ponderosa pine) were eliminated and the table, therefore, shows the percentage by species in the original stand and the treatment in marking.

It is seen that 60.4 per cent by number of trees, of the average stand is ponderosa pine, 26.7 per cent is Douglas fir and 12.9 per cent is lowland white fir. In ponderosa pine, no trees are cull trees, i. e., trees so defective that the net scale is less than 25 per cent of the gross scale, while in Douglas fir 0.4 per cent are cull trees and are marked for girdling. In lowland white fir 8.4 per cent are cull trees. It is readily apparent that lowland

Table 1

AVERAGE DISPOSITION OF SPECIES PER 100 TREES, COVERING 3.2 ACRES

Species	Marked	Left	Girdled	Total
Ponderosa pine (*Pinus ponderosa*)	28.7	31.7	0	60.4
Douglas fir (*Pseudotsuga taxifolia*)	9.7	16.6	0.4	26.7
Lowland white fir (*Abies grandis*)	2.9	1.6	8.4	12.9
Total	41.3	49.9	8.8	100.0

white fir is a very defective species. On the average, 21 times as many lowland white fir trees are marked for girdling as are Douglas fir. Also, we mark 2.9 times as many lowland white fir trees for girdling as we do for cutting, and mark for cutting 1.8 times as many trees as we leave for growing stock.

The above statements give a good general idea as to conditions regarding defects of the various species in the stand. Ponderosa pine has practically no cull trees, Douglas fir a few (1.5 per cent) and lowland white fir many (65 per cent).

Scaling Losses by Species

Ponderosa pine. Rots, in both butt and trunk, are a small item comparatively speaking for ponderosa pine as compared with other deductions made from gross scale. Refer to Table 5. Butt rot comprises but 5 per cent of the total deductions and trunk rot but 1 per cent, the two combined totaling but 0.36 per cent of the gross scale.

Breakage, not a defect, but necessitating deductions in scaling, is the largest item for this species, totaling 38 per cent of the total deductions, and 2.66 per cent of the gross scale.

Next in extent is catface, caused by ground fires, which totals 24 per cent of the deductions and 1.6 per cent of the gross scale.

The third in importance is loss in tops. We have considered throughout all material to a seven-inch top diameter inside bark, as called for in the sale contract. The loss in green tops constitutes 21 per cent of all deductions and 1.46 per cent of the gross scale. These figures include the 11 per cent of total and 0.74 of gross scale as given in Table 5 and an additional 10 per cent of total and 0.72 per cent of gross scale in tops otherwise merchantable which are cull because of breakage and classified as breakage in Table 5. Of the 11 per cent of total and 0.74 per cent of gross scale, 10 and 0.68 per cent respectively, are in tops unmerchantable because of crook, fork or general roughness, and 1 and 0.06 per cent respectively, are in merchantable tops not cut. The latter is an avoidable but inconsequential loss. Of 100 trees studied but 16 were utilized to a seven-inch top. The run is as shown in Table 2.

Table 2

TOP DIAMETERS FOR AVERAGE CUTTING IN PONDEROSA PINE

Diameter inside bark of top log. Inches	Number of trees
7	16
8	18
9	16
10	8
11	10
12	6
13	6
14	2
15	10
16	2
17	2
18	2
20	2
Average 10.6	Total 100

Of the above number of trees, eight ees which were cut to an eight-inch top ould have been cut to a seven-inch top. n the average for these eight trees, three et (linear) more per tree could have een utilized. Four trees which were cut a nine-inch top could have been utiled to a seven-inch top. On the average r these four trees nine feet in length ore per tree could have been utilized. therwise, all merchantable material was tilized.

Douglas fir. In Douglas fir the heaviest ss is from butt rot which comprises .68 per cent of gross scale. Next is catace comprising 2.23 per cent of gross cale. These two losses are considered toether, as butt rot usually accompanies atface, both being the result of ground res. Together they comprise 55 per cent f the total loss for the species.

Third in importance is breakage, though his item is considerably less than it is or ponderosa pine.

Fourth in extent is shake or separation f rings, a loss which is inconsequential n ponderosa pine.

We have a loss for this species which ve do not have for ponderosa pine, a oss from the formation of pitch seams, he pitch ccurring in pockets between the rings of wood. In ponderosa pine the pitch is massed in the wood fibers rather than in seams or pockets.

Douglas fir shows a greater loss from sweep than does ponderosa pine or lowland white fir, due to crooked butt logs from trees growing on steep slopes, the logs being of the "sleigh-runner" type.

Lowland white fir. The heaviest losses in lowland white fir are from butt and runk rots. We have already discussed the heavy losses encountered in marking for this species and have shown that of each 100 lowland white fir trees considered for marking, 65 are marked for girdling as being cull trees. Our experience has been that any tree with visible conks or catface is a cull tree because of trunk or butt rot, or both. In addition to this loss, in the scaling of material from merchantable trees we have a loss from butt rot comprising 4.01 per cent of gross scale and a loss from trunk rot comprising 2.69 per cent of gross. Much of this is due to the fact that the catface caused by ground fire was small originally and had grown over so that no defect was visible when marking was done.

Third in extent is loss in tops comprising 1.16 per cent of gross scale.

Fourth comes loss from breakage and then shake, frost crack, sweep and catface in the order named.

Loss from frost crack should be noted, as it is a loss seldom encountered in other species. This defect is common in this species. Frost causes a split in the butt logs of the tree, thereby necessitating a deduction because of cracked material besides affording a source of entrance for infection of rot-productng fungi.

Pitch is never encountered in the logs of this species.

TABLE 3

VALUES LOST PER ANNUAL CUT OF 10,000,000 FEET, BOARD MEASURE (NET). CASCADE WORKING CIRCLE

	Scaled	Marked	Total
Controllable losses:			
Fire		$1,376	
Catface	$ 537		
Butt rot	159		
Top	252		
Breakage	867		
Dead trees	253		
Total controllable	$2,068	$1,376	$3,444
Noncontrollable losses			
Disease-trunk rot	$ 40	$1,377	
Other losses	226		
Total noncontrollable	$ 266	$1,377	$1,643
Total losses	$2,334	$2,753	$5,087

These values are arranged on an acre basis in Table 4.

General Remarks

Few forest officers, even scalers and timber sale men, while realizing there are considerable losses in our overmature stands of timber, ever made sufficient analysis to realize the total amount involved. On a percentage basis the significance of the figures is not readily apparent. For this reason, in Table 5, figures are given which show by classes and species, the values in dollars of the amounts lost in an average season's run on the Cascade Working Circle. For the sake of emphasis there is offered the summary in Table 3, which divides the losses into items which are at least partially controllable, including fire losses such as catface with its accompanying defect, butt rot, breakage, loss in tops, and loss in dead trees; and secondly, noncontrollable items such as trunk rot, sweep, shake, pitch, forks, and dead tops.

Table 4

VALUES PER ACRE OF LOSSES BY SPECIES

Species	Scaled: Controllable	Scaled: Noncontrollable	Marked: Controllable	Marked: Noncontrollable	Total
Ponderosa pine	$2.13	$0.23	$0.00	$0.00	$2.3
Douglas fir	.10	.03	.07	.06	.2
Lowland white fir	.05	.03	1.44	1.45	2.9
Total	$2.28	$0.29	$1.51	$1.51	$5.5

These figures are derived as follows: For scaling they are taken from Table 5. For marking we calculate as follows: girdle 2.63 lowland white fir and 0.11 Douglas fir per acre with an average volume per tree of 1,000 feet board measure. Stumpage price for these two species is $1.10 per thousand feet board measure. The average area cut per annum is 910 acres. The exact proportions cannot be determined and we have assumed that for lowland white fir and Douglas fir that

Table 5

BREAKAGE AND DEFECT VOLUME LOSSES

Nature of loss	Ponderosa pine: Percentage of gross scale	Ponderosa pine: Percentage of total deduction	Ponderosa pine: Value lost per annum[1]	Douglas fir: Percentage of gross scale	Douglas fir: Percentage of total deduction	Douglas fir: Value lost per annum	Lowland white fir: Percentage of gross scale	Lowland white fir: Percentage of total deduction	Lowland white fir: Value lost per annum	Weighted average: Percentage of gross scale	Weighted average: Percentage of total deduction	Weighted average: Value lost per
Breakage	2.66	38	$843	1.21	14	$16	1.15	11	$8	2.40	34	$86
Catface	1.60	24	507	2.23	25	30	0.02			1.57	23	53
Dead tree	0.80	11	253							0.66	9	25
Tops	0.74	11	235	0.61	7	8	1.16	12	9	0.75	11	25
Dead tops	0.61	10	193							0.50	8	19
Butt rot	0.30	5	95	2.68	30	35	4.01	40	29	0.80	9	15
Trunk rot	0.06	1	19	0.06	1	1	2.69	27	20	0.23	3	4
Shake				1.25	14	17	0.56	6	4	0.17	2	2
Pitch seam				0.45	5	6				0.05	1	
Sweep				0.25	3	3	0.14	1	1	0.04		
Frost crack							0.27	3	2	0.02		
Forks				0.03	1							
Total	6.77	100	$2,145	8.77	100	$116	10.00	100	$73	7.19	100	$2,33

[1] Based on the average annual cut on the Cascade Working Circle of 10,000,000 feet broad measure, net scale.

Gross cut of Ponderosa pine, 8,900,000 feet board measure, 82.6 per cent of the total cut; Douglas fir, 1,207,000 feet board measure, 11.2 per cent of the total cut; Lowland white fir, 668,000 feet board measure, 6.2 per cent of the total cut.

Stumpage values per 1,000 feet board measure: Ponderosa pine, $3.56; Douglas fir, $1.10, and Lowland white fir, $1.10.

50 per cent of the trees were cull trees because of disease before ground fire caused catface and that the other 50 per cent were rendered cull by ground fires causing wounds which allowed disease to enter.

From the figures in Tables 3 and 4, it is readily apparent that losses are considerable. While some losses are unavoidable and cannot be remedied while cutting in mature and overmature stands, the fact that a loss of $3,444 per annual cut, or 57.7 per cent of the total is in items partially controllable, should cause us some little concern. A loss of $2,072 per annual cut, or 40.7 per cent of the total is caused by fire, exclusive of material directly consumed or killed by fire or by beetle work following. This amounts to $2.28 per acre throughout average ponderosa pine stands. It is a loss or damage over and above the losses from fire annually reported on and has seldom or never been considered or given much thought. While loss in tops is a small item, it still can be reduced somewhat by closer sales supervision. Losses in breakage are heavy, and while much of it is unavoidable, some can be eliminated by closer supervision of cutting crews. Loss in dead trees, which consists of cutting beetle-killed trees, can be reduced by reducing the number of such trees by insect control measures directed against attack in the endemic stage.

Application of the above suggested control measures should minimize the losses in our present mature and overmature stands. Losses in future stands should be much less than they are in the present cut, because defective and diseased trees are eliminated by cutting or girdling, and under a 120- or 160-year rotation we never again will have the large proportion of large, overmature trees which break badly in falling and which also are subject to disease after passing the thrifty, rapid-growing stage.

Since 1905, 25 counties in Washington have received directly $1,734,576.20 or one-quarter of the total gross receipts from the 9 national forests. This money is required by federal law to be used by the counties for roads and schools. During the same period 31 counties in Oregon have received directly $2,749,831.90.

BRIEFER ARTICLES AND NOTES

Plant Indicators in Southeastern Alaska

In connection with a study of site prediction after the removal of virgin timber, all the important vegetation was listed on a number of plots in the hemlock-spruce type in southeastern Alaska. The lists seem to show that a definite correlation exists between the occurrence of certain of the plants noted and site index as indicated by total height at 100 years of age.

Table 1 shows the relation between the site index and the percentages of plants of given species in the total number of plants present.

These figures were read from curves drawn through plotted points which gave a definite trend. Additional data will probably do much to strengthen the position of the curves. The trends bear out previous observations in the case of devil club, salmonberry, and blueberry, but it was not realized that the bunchberry or trailing raspberry held any significance. With further data available probably other species will show such relationships.

Just what use will be made of this information is not known at present. In the forest it is easier and more accurate to measure total heights of dominant trees, but if similar characteristics are observed on cut-over land there may be a definite use for such plant indicators in the identification of site on these logged areas.

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Comment on Cutting Tests for Seeds

Mr. Read's note on *The Hammer Test for Judging Seeds* in the March, 1932 issue of the Journal is of much interest, and probably will be most useful for large-seeded species. It is merely a variation, using greater force appropriate for large seeds, of the usual practice of the writer in cutting small seeds. As pointed out by Mr. Read, small seeds are awkward to hold while cutting; therefore they may be crushed with the flat of a knife blade instead of being cut in two. This spreads the seed contents out on the paper, and makes it much easier to decide whether a seed is "good," "bad," or "empty," than a direct cut across the seed. All seeds except the largest pines may be crushed readily with a knife; this is quicker and less laborious than using a

Table 1

RELATION BETWEEN SITE INDEX AND INDICATOR PLANTS

Species	Site Index							
	40	50	60	70	80	90	100	110
	Per cent of species in total vegetation							
Devil Club (*Fatsia horrida*)		0.4	3.0	6.5	10.5	16.0	23.0	32.0
Salmonberry (*Rubus spectabilis*)			0.2	3.2	8.0	14.6	23.6	32.2
Bunchberry (*Cornus canadensis*)	24.5	20.6	16.5	12.4	8.3	4.2		
Blueberry (*Vaccinium ovalifolium*)		32.0	28.6	25.4	22.0	18.8	15.4	
Trailing raspberry (*Rubus pedatus*)	20.8	15.6	11.5	8.0	5.2			

Basis, 166 tenth-acre quadrats.

hammer. Cutting tests are extremely useful in seed extraction operations, in order to determine whether seed should be recleaned to eliminate "blind" seed, and with certain large-seeded species, of high average viability, it may be sufficient to determine the amount of seed to be sown. Thus the cutting test is usually considered sufficient for *Abies pectinata.* In determining the amount to be sown, it would be better to take account also of purity, and compute the utilization value, using cutting test per cent instead of germinative energy per cent to combine with purity in the usual equation. Where facilities are available, germination tests are always desirable as a supplement to cutting tests. Even with the southern pines, complete tests can be run in 60 days, allowing 30 days for preliminary stratification. Following stratification most species have germinated from 70 to 90 per cent in from 5 to 10 days on the Jacobsen apparatus. The time of stratification may quite likely be reduced under proper conditions, and permit of a complete test in one month.

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Forestry at Crossett, Arkansas

The Crossett Lumber Company is one of the leaders in forestry work in the South. Recently its forester, A. E. Wackerman, resigned to accept an appointment at the Southern Forest Experiment Station. Mr. Wackerman was with the company nearly five years. "During that time," he writes in the April, 1932, *Yale Forest School News,* "forestry became firmly established as a policy of the Company, and it was demonstrated that fire protection can be made effective at a moderate cost of not more than four cents an acre a year. The figures on acreage burned show a marked reduction in fire losses each year on 350,000 acres as follows:

1928 — 25,000 acres burned
1929 — 18,000 acres burned
1930 — 12,000 acres burned
1931 — 4,800 acres burned

"This progress was made in spite of two years of severe drought, the year of 1930 being especially bad. The accomplishments in fire protection were possible only because of the intense interest of the Company in eliminating fire from its holdings, and of the character and ability of the field force we were permitted to organize. At first, some public antagonism, to forestry in general and fire protection in particular caused considerable grief to the fire fighters, but as the confidence of the public was gained, and their coöperation secured, the task became easier, and as time goes on fire protection should be less arduous.

"Not only is the Crossett Lumber Company progressive in fire protection, but it also logs carefully by means of teams, leaving all trees below 13 inches d.b.h. and at least two seed trees over 13 inches per acre. There is a minimum of injury to the trees left, as the logging crews are well trained in this respect. The Forestry and Logging Department of the company has charge of all land and timber matters, including the land and timber deeds, tax lists, etc., as well as the forestry and logging work. Practically the entire cut-over area owned by the company has reproduced to good stands of second growth and the seed trees left on the recently logged areas are seeding up the land 100 per cent.

"The fact that I have left the Company to accept a position at the Southern Station does not mean that the company will allow its forestry program to lapse, as it is well recognized by the officers and employees of the company that the future

success of the business depends upon its young timber. Mr. L. R. Wilcoxon, who is in direct charge of forestry and logging, is as good a forester as anyone and he is carrying on for the time being."

Seed Release from Western White Pine and Ponderosa Pine Cones

Struggling for enlightenment to explain the occurrence of scattered small white pine seedlings (*Pinus monticola*) on very extensive double burns in northern Idaho, the thought occurred to the writer that if there were any seeds released in the winter time they would travel miles from the parent trees over crusted snow. But the popular notion had been that cones of this and many other species released all the seeds during the autumn of ripening.

Early one spring, there was no opportunity to climb the stunted western white pine trees on the state line divide at the headwaters of the Coeur d'Alene River in Idaho and examine the contents of the cones ripened the preceding autumn. They still contained a small amount of apparently good seed although the trees on which they grew must sway almost continuously in the strong wind passing over the divide. From this point and with the knowledge that some seed was available for winter dissemination, it was easy to visualize seeds scudding for miles over the expanse of smooth snow-crusted hills below, finally becoming lodged against a snag or other obstruction, settling down to the soil with the melting snow and later germinating and becoming established in the protected and moisture-soaked places.

The seeds found in the cones might have become locked between the scales and would never be shaken free by any natural process. This uncertainty led to further investigations.

In the fall of 1930, two freshly ripened cones each of western white pine and Ponderosa pine (*Pinus ponderosa*) were enclosed in light wire screen cages attached to the limbs. The cages were cylindrical, about 18 inches in diameter and 6 inches high. Ordinary fly screen was used and provisions made to open the cages with a minimum amount of disturbance to the cones to remove the seeds that had dropped to the bottom of the cage beween examinations. The caged cones were out on the periphery of the crowns where they were fully subject to wind drying, but cones on the north side of the tree were selected. The trees stood alone in the open.

The caged cones ripened and opened normally with those not covered by the screen. After heavy rains the ponderosa pine cones, both inside and out of the cage, closed perceptibly. This was not noticeable with the white pine. Examinations were not made at regular intervals, but as opportunity permitted. The two species were several miles apart so examinations of both were not always made on the same dates. Table 1 gives the rec-

Table 1

PROGRESS OF THE RELEASE OF SEEDS FROM CONES

1930	Pinus monticola Hollow seed	Pinus monticola Plump seed	Pinus pondersosa Hollow seed	Pinus pondersosa Plump seed
September 24	—	—	3	0
October 29	4	4	0	9
December 4	1	0	5	3
1931				
February 8	0	10	—	—
April 9	—	—	5	1
May 12	16	84	9	62
June 16	—	—	23	4[3]
	—	—	11	6[1]
June 20	13	68[2]	—	—
October 6	—	—	5	1
	—	—	10	1[3]
Total	34	166	71	87

[1]One cone had dropped off and 17 seeds were in it.

[2]Both cones had dropped off. Count includes seeds left in cones and those which had fallen out.

[3]Count of seeds in the cone. It was picked from the branch for the final count.

d of seeds released from the time the ones first opened until they became detached from the branches.

The results were not at all as expected. nstead of the principal release coming in e autumn with a few seeds released hereafter through the winter, dissemination was very light in the fall with the ig release coming the following spring. had also been expected that the early elease would be of the heaviest seed but his did not happen. Fifty-five per cent f the first two counts of white pine was ollow seed and fifty per cent of the first hree counts of yellow pine seed was holow.

Examination of uncaged cones disclosed eed still in them at the time the experiment was terminated.

D. S. Olson,
U. S. Forest Service,
Missoula, Mont.

What Forms Chlorophyll

A better knowledge of chlorophyll chemistry may lead to the better feeding of rnamental trees. O. Raber (*Science*, Apr. 24, 1931) has grown corn plants in utrient solution in the dark and finds hat much greener plants are produced when liver extract is added to the solution. Liver extract has proved valuable n the cure of pernicious anaemia in human beings. The chemical evidence at present available suggests that material rom liver active in pernicious anaemia onsists of one or more pyrrole precursors which may be utilized in the formation of hemoglobin. The greater chlorophyll content noted by Raber may indicate that the pyrrole precursors also can e utilized by plants in the formation of hlorophyll. If so, chemists may be able o produce a superior plant fertilizer rom coal tar by following up this lead.

S. B. Detwiler,
U. S. Bureau of Plant Industry.

A Weevil-Repellant Strain of Jack Oak

A request for acorns of jack oak (*Quercus ellipsoidalis*, E. J. Hill) by Dr. O. Heikenheimo of the Finnish Forest Research Institute set the writer to searching for the desired material during the field season of 1931.

This oak is found throughout the northern Lake States, but because of the higher average winter temperatures prevailing in the Lower Peninsula of Michigan and, therefore, the greater similarity to conditions in Finland, the search for acorns was conducted there rather than more to the westward in the species' range. More specifically the acorns were sought on the Huron National Forest, which covers portions of Crawford, Oscoda, Ogemaw, Alcona, and Iosco counties, Michigan.

It became apparent rather early in the season that the seed crop would be a light one.

During the latter part of September, as the acorns became ripe, a large number of trees were examined from time to time. In practically every case the acorns were worthless. Usually they were all weeviled. In a few cases, there was no evidence of weevil work, but the kernels were dried up.

Finally, however, five trees were found which had sound acorns. These were all located in section 1, township 22 North, range 6 East. The seed crop on these trees was not large, but it was above average for the season. A cutting test was made on 20 acorns from each tree, and strangely enough this test indicated the nuts to be 100 per cent sound. This was in glaring contrast to what had been found in all other instances.

Sargent, in part, describes the acorns of *Quercus ellipsoidalis* as follows: "Acorn ellipsoidal, cylindrical to subglobose, chestnut-brown, often striate and

puberulous." On four of the trees with sound seed the acorns ranged between cylindrical and subglobose in shape; on the fifth they were nearly ellipsoidal in shape. All of them were striate.

The restricted locality in which these trees were found might indicate that some factors of site were responsible for the sound seed. However, these particular individuals were not found in a group but were interspersed among others which showed the common heavy weevil injury. Does it not seem quite probable that these trees had developed a hereditary resistance to weevil injury?

P. O. Rudolf,
Lake States Forest Experiment Station.

Loss In Oversize Sawing of Douglas Fir Lumber

In the recent survey of so-called "waste" in the Douglas fir mills of western Oregon and Washington and reported by Herman M. Johnson, in the Dec., 1931, *Research Notes* of the Pacific Northwest Forest Experiment Station, several hundred accurate measurements of the lumber sizes manufactured were made at each of the six mills studied. Table 1 shows the nominal sizes and also the actual average sizes cut. It will be noted that in all cases, the actual dimensions cut were in excess of the nominal dimensions. The nominal sizes in all items are considered to allow sufficient material for shrinkage in drying, dressing, and running to pattern. There is a loss in wood volume in the one-inch stock due to cutting oversize of from 4.22 to 9.02 per cent and in the two-inch stock 1.41 to 7.41 per cent. Although this loss is not large for an individual piece, the aggregate loss where large quantities are produced would be considerable.

Table 1

ACTUAL AND NOMINAL DIMENSIONS CUT IN DOUGLAS FIR MILLS AND THE WASTAGE FROM OVERSIZE SAWING

Nominal dimensions Inches	64th of inch	Actual dimensions 64ths inch	Loss per cent
1 x 3	64 x 192	68 x 197	9.02
1 x 4	64 x 256	66 x 263	5.94
1 x 6	64 x 384	67 x 391	6.60
1 x 8	64 x 512	68 x 518	7.57
1 x 10	64 x 640	68 x 647	7.41
1 x 12	64 x 768	66 x 777	4.22
2 x 3	128 x 192	134 x 197	7.41
2 x 4	128 x 256	131 x 261	4.34
2 x 6	128 x 384	130 x 391	3.41
2 x 8	128 x 512	130 x 521	3.33
2 x 10	128 x 640	129 x 644	1.41
2 x 12	128 x 768	131 x 776	3.41

Lumber Content of Sound Western Yellow Pine Logs

Log rules are used to measure the board-foot volumes of logs of different diameters and lengths. Construction of a reliable log rule presupposes certain manufacturing practices, and any deviation therefrom results in an excess or deficit in the scaled contents, known respectively as overrun and underrun.

A comparison is made in Table 1 between the Scribner log rule and the actual board footage obtained from over 2,000 sound sixteen-foot western yellow pine logs of different diameters, turned down in sawing at two modern eastern Oregon band mills. The tally, made of the lumber in a rough-green state, is of No. 5 Common and Better grades, excluding molding strips and six-foot or shorter Common and Select pieces.

At one of the mills light slabbing and intensive manufacture were practiced, resulting in a three to four per cent greater recovery of lumber. This same mill had an average overrun of 21.42 per cent for the mill-run of sound logs of all diameters and lengths which were either sawed alive, taper sawed, or turned down in

TABLE 1

LUMBER TALLY, LOG SCALE, AND OVERRUN PER CENT
FOR SOUND SIXTEEN-FOOT WESTERN YELLOW PINE LOGS OF DIFFERENT DIAMETERS

Log diameter Inches	Lumber[1] tally Board feet	Log[2] scale Board feet	Overrun Per cent	Log diameter Inches	Lumber tally Board feet	Log scale Board feet	Overrun Per-cent
				21	335	300	11.7
10	90	60	50.0	22	367	330	11.2
11	102	70	45.7	23	403	380	6.1
12	115	80	43.7	24	440	400	10.0
13	128	100	28.0	25	479	460	4.1
14	145	110	31.8	26	518	500	3.6
15	165	140	17.8	27	559	550	1.6
16	188	160	17.5	28	600	580	3.4
17	215	180	19.4	29	643	610	5.4
18	242	210	15.2	30	686	660	3.9
19	272	240	13.3	31	733	710	2.8
20	301	280	7.5	32	766	740	4.9

[1]Lumber tally, No. 5 Common and Better rough-green lumber, excluding molding strips and lumber shorter than six feet.
[2]Scribner log rule.

sawing. The second mill had a smaller overrun, 15.30 per cent. The composite overrun for both mills based on all sound logs, numbering 4,716 was 17.85 per cent. (From Dec., 1931 *Research Notes*, Pacific Northwest Forest Experiment Station).

E. F. RAPRAEGER.

GOVERNMENT RELATIONS OF THE LUMBER INDUSTRY

Business depression brings into sharp relief the intimate relationship between government and industry and this has been reflected in the activities of the National Lumber Manufacturers Association during 1931.

For the first time in the history of the lumber industry the government has officially recognized its distressed condition and the necessity, from the public point of view, of contributing a fair share toward the solution of the industry's problems. The President, to this end, has appointed the Timber Conservation Board which during the year has completed its organization, appointed various committees and sub-committees for the study of industry problems, and has already received the reports of several of these committees. Of special importance and interest has been the contribution of the Board, through its Special Lumber Survey Committee, in preparing and publishing for the industry quarterly reports summarizing all available facts relating to current lumber consumption and stocks, and providing the basic material for intelligent planning. In the work of this Survey Committee, as well as the work of other divisions of the Timber Conservation Board, the services of the personnel of the Association have been freely given in a consultative capacity. Mr. Compton was asked by Secretary of Commerce Lamont to serve as secretary of the Lumber Survey Committee. A number of members of the staff have also served as members and secretaries of other of the Board's committees. The progress already made by the Timber Conservation Board forecasts results of important and lasting interest to the future stability of forest enterprises in the United States.

Closely allied with the work of the Timber Conservation Board has been the

attention devoted by the Association to legislative matters which appear to promise assistance in solving the industry's important problems. One of these is the question of modifying the antitrust laws so as to grant the necessary freedom of action which will permit the industry to proceed in orderly fashion to solve its own problems. In this matter, close contact has been maintained with other natural resources industries, and other interested organizations such as the American Bar Association and the United States Chamber of Commerce.

During the year, in recognition of the emergency, the conservative timber sale policy of the U. S. Forest Service was strengthened so as to suspend unnecessary sales of government timber in National Forests and a similar policy was extended to the Public Domain and the Indian lands.

The proposal by the railroads that they be granted an emergency increase in freight rates of 15 per cent was vigorously contested by the Association during the summer. Mr. Compton, representing the lumber industry, testified before the Commission at the hearings in Chicago and thereafter a brief was filed with the Commission. In the decision finally approved by the Interstate Commerce Commission lumber and timber products have received more favorable consideration than any other group of commodities outside of agriculture.

No problem bearing on the future stability of the lumber industry is of greater importance than that of possible future foreign competition, and particularly the potential competition of Russian lumber. Aside from the other factors involved, Russian competition introduces serious, disturbing, influences into business against which the industry without protection of law, cannot safeguard itself. The Association has, therefore, devoted much time and effort to the problem of securing ad- quate protection against future Russia lumber imports. Thus far these impor have been relatively small. But the importance is to be measured not by the present volume, which is small, but b their potential future volume, which very large.

The Association has invoked vario provisions of the Tariff Act in its effort t prevent Russian trade in this market. I efforts have been successful to the exte of reducing the imports of Russian lum ber in 1931 to one-fourth of the quanti imported in 1930 and of pulp wood t about one-eighth. They have been unsu cesful to the extent that, by one device c another, the protective measures invoke have gradually been broken down c evaded. Prevention of continued evasio necessitates new legislation which will co rect deficiencies and inadvertent "jokers in existing law. Two bills of particula importance already introduced are one b Senator Oddie which proposes to lay general embargo on all Russian import and one by Congressman Kendall, whic will make effective the provisions of exis ing law which seek to prohibit the im portation of goods made by convic forced and indentured labor. It is hope that the favorable action on at least on of these bills can be secured before th adjournment of Congress in June. Lum bermen everywhere have been urged t interest their representatives in Congres in this important legislation.

In addition to the major projects o special importance which have been men tioned above, the Association has con tinued its constant close contact wit various government departments and com missions which carry on activities of in terest to the lumber industry.

The National Lumber Bulletin,
January, 1932.

The Angle Mirror in Sample Plot Work

The angle mirror finds two very effec- e uses in sample plot work; first in the ying out of rectangular plots and sec- ıd in plotting the position of trees on e plot itself.

The best type of instrument for this ork is one having the mirrors set at 45° that an angle of 90° is obtained. The andle can be unscrewed when not in use an aid toward compactness. A small lumb bob screws into the handle, in- reasing the precision obtainable since the strument can be held very accurately ver a point. The two mirrors are set in frame. The space above the frame is oid. Placing the eye at this void and ooking into the opposite mirror a reflec- on of a line or point is obtained. Look- ng thru the opening immediately above e reflected image is the line or point at ight angles to the reflected object. The irrors are capable of adjustment so the esults obtained can be made exceedingly ccurate. This type of instrument sells for bout $10.00.

The specifications for accuracy with hich the federal forest experiment sta- ions are expected to comply establish a imit of error in sample plot work of one n one thousand. Other research organiza- ions are using the same limiting ratio. It s not difficult to obtain but it is awk- ard. It is somewhat beyond the usual imits of transit and stadia work and is ust about the possible limit for compass ork. Furthermore, a transit is expensive quipment, comparatively slow to operate nd cumbersome. This narrows the field o the compass. A straight line can be asily projected with the Forest Service ompass within the prescribed limit of rror. Angles, however, can not be turned ith such an instrument closer than the earest 15 minutes or with an error of ap- roximately one in two hundred.

The solution is found in the angle mirror which will give the desired results in laying out 90° angles.

For small sample plot work (about one-fourth acre or less) the angle mirror is sufficient equipment. For larger plots or plots laid off in groups, an angle mirror and a compass are more effective; the angle mirror to lay off the right angles and the compass to project the lines (using back sights and not running by the needle).

The success of the second use of this little instrument, that of plotting the position of trees, depends on the character of the vegetation. In such plotting, the area is broken into small squares of about 50 feet on a side. In quarter-acre plots this means dividing the plot into four quarters. Establish the center lines of the plot and stretch a tape along each (200-foot tapes will save much time in this work) so that the 100-foot graduations may be lashed together and to a stake at the center of the plot. With three men doing the work one man can designate the tree to be plotted while the other two men, each walking along a tape with an angle mirror to which is suspended a plumb bob, can observe the tree and then look at the point on the tape indicated by the bob and call out the coördinates of the tree as taken from the tape intersections at the center of he plot. The men designating the tree to be observed can then plot its position.

The weakness of this system is brought out forcibly in brushy country or where there is a large amount of undergrowth. In such cases the plumb bob from the angle mirror will be deflected from its normal position by the shrubbery and a poor reading on the tape will result. This is not so objectionable as might at first appear since many plots are selected in fully stocked mature stands and in most

cases under these circumstances there is little or no brush and low growth.

It may be argued that this method will not work on sloping ground due to the excess of slope over horizontal measurements. Slope allowance can, however, be made satisfactorily. With an Abney level it is possible at the beginning of the work to measure the slope along the tape lines from the center of the plot and a very slight mental subtraction in sufficient to correct the slope reading to the horizontal. (If a per cent Abney level is used, a table can be easily computed for the correction to be applied to slope distances to obtain the horizontal equivalent.)

This method has been found to be very rapid where applicable and sufficiently accurate for the nature of the information obtained. The average time consumed in plotting on quarter-acre plots averaged 70 trees per hour for twenty plots. This includes laying the tapes and lashing them. Much greater speed can be attained. With the advantages of increased speed, portability, ease of operation and low cost, the angle mirror should be considered a necessity in most sample plot work.

JOHN C. SAMMI,
N. Y. State College of Forestry.

A NEW OR A RENEWED VISION

For over thirty years foresters have struggled to convince the people of the United States of the need and the importance of forest conservation. While considerable progress has been made, especially in the adoption of the principle, foresters know only too well that there is very little actual forestry practiced on privately owned lands. We know, too, that while the federal government and some of the states are carrying on a measure of forestry upon their own lan[d] that they are one and all reluctant [to] practice forest conservation on a sca[le] commensurate with the problem involve[d].

Forest conservation is one of the large[st] and one of the most vital problems fa[c]ing the United States today. It is of su[ch] importance because it involves the fund[a]mental structure of our civilization an[d] the future happiness and contentment [of] our people. An abundance of lumber an[d] of other forest products of every varie[ty] and in every locality produced as cheap[ly] as it is humanly possible to do so is on[e] one of the objectives of forestry and [forest] conservation. Probably just as importan[t], or even perhaps more so, is the need [of] tree cover to sooth the fagged minds an[d] bodies engendered by our modern civili[za]zation. Nor must we forget the host [of] other benefits derived from our forest[s] such as the regulation of streamflow, r[e]tardation or prevention of erosion an[d] floods, purification and the conservatio[n] of water supply, the production of gam[e] and the ameliorating effect of forests upo[n] our local climatic conditions. Each on[e] of these uses justifies supreme efforts t[o] secure the nation-wide practice of forestr[y].

Let us not be confused or misled b[y] minor issues which have and always wi[ll] arise in such a far flung problem a[s] forest conservation. Russian pulpwoo[d] importation, the inroad of substitute[s] and the forced liquidation of virgin tim[]ber stands are merely manifestations o[f] the existence of a larger and more vita[l] problem. True, these minor problem[s] should and must be solved, but let fo[r]esters not be blinded by short-live[d] petty, and personal motivations and fo[r]get the all-important problem of makin[g] this country the happiest, healthiest, an[d] wealthiest place in which to dwell, n[ot] only now, but also in the future and n[ot] only for a few of our people, but for al[l]

This major goal should never be lost ght of in the formulation of forest pol- y or its execution. Foresters struggling th administrative problems and for a elihood have, I fear, often been so se to the elephant that they could not e him in his entirety. Were this just a mentary expediency no word of cau- n would be necessary, but our thirty ars of struggle seem in some respects have made it a matter of habit both in tion and in thought.

Foresters have for so many years been rced to comfort and content themselves ith a whole-hearted approval of the ob- ctives sought, but received such nig- rdly support to attain these objectives, at they have in many instances ceased demand, nor even hope for, a rapid lfillment of the program of a nation- ide practice of forestry. In govern- ental affairs, foresters have had to take e appropriation crumbs for so many ears that we have ceased to think in rge figures befitting the seriousness of e problem. Boulder Dam and Missis- ppi Flood control, sectional problems, eceive immense appropriations for ex- enditures whose economic soundness ay even be questioned, while the uni- ersal problem of forest conservation re- eives scant attention in all legislative alls. If a state plants a few million rees the news is received by a herald of rumpets instead of a note of apology or having accomplished so little.

Foresters must shoulder the blame for he relative inaction in the execution of onservation policies; they can no longer ide behind the excuse that public inter- st must still be developed. The public nterest is there, but the leadership is acking! If professional foresters will not ccept this responsibility future leader- hip in conservation matters will be as- umed by inexperienced laymen, and we will have to be content to assume the role of the hired man, perhaps to watch unwise policies executed.

Acceptance of leadership in the execution of conservation policies carries with it the responsibility for the success or failure of those policies. Policy statements can be promulgated with comparative safety; it is only when they are applied that the forester's reputation is at stake. So, while we should vigorously urge the adoption of forest policies, we should be sure that we can justify that adoption because our mistakes will burden the nation.

Let us accept the challenge, acquire a new vision or renew the old. Let us marshal public opinion and demand action where and when needed commensurate with stupendous importance of forestry to the nation.

P. A. HERBERT,
Michigan State College.

AERIAL PHOTOGRAPHIC MAPPING

At the December 21, 1931, meeting of the Northern Rocky Mountain Section of the Society, Mr. Howard Flint, Regional Forest Inspector, gave an interesting and instructive talk on aerial photographic mapping. Mapping, Mr. Flint said, has been known to the world for 2,100 years. Photographic mapping, however, was first suggested by Arago in France about 92 years ago, and 14 years later Laussedat, also of France, put the first oblique photographic mapping into actual use. The first experiments in aerial photography were made with kites, pigeons, rockets, and balloons. The World War brought out the need for aerial mapping, and the aeroplane became the medium. The last ten or fifteen years have marked

a new era in aerial mapping, and great strides have been made in developing equipment and methods.

Mr. Flint stated that there are several makes of aerial cameras now in use, but those equipped with high-class universal focus lenses, between the lens (iris type) shutters, interchangeable magazines, and roll films were most popular and practical. The latest U. S. Army camera has five lenses and covers a strip twenty miles wide from an altitude of 20,000 feet. Panchromatic hypersensitized films, Mr. Flint stated, are almost universally used. A new film uses infrared rays. Haze is a great obstacle in taking air pictures and ray filters to eliminate the effects of this haze are now made in yellow, blue, and the very latest, in black. With the aid of ray filters great depths of haze can be penetrated, far beyond the reach of the human eye. To illustrate this point, Mr. Flint exhibited pictures taken of Mt. Hood by Captain A. W. Stevens of the U. S. Army Air Corps at an altitude of 20,000 feet above sea level from Weed, California. Mt. Hood, 227 miles distant, was not visible to the naked eye, but in the picture came out clear and distinct. This is the longest distance terrestrial picture on record. Captain Stevens also successfully photographed Dayton, Ohio, through a haze from an altitude of about 31,000 feet.

The stereoscope is also an important instrument developed to bring out relief, the third dimension in photographs.

Several types of planes have been used but all are more or less a makeshift except the special high-winged, glazed-floor monoplane capable of climbing to great heights. This plane costs approximately $18,000, and is equipped with superchargers for the motor and artificial oxygen for the men.

One of the greatest difficulties in taking air pictures over unmarked country is to fly the strips straight and in parallel lines. The lap in the pictures, if they are to be of value for mapping, must be at least 50 per cent in line of flight and may be somewhat less laterally. Five to five and a half hours and 250 exposures at 14,000 feet over an area of sixty to seventy square miles constitute a day's work for ordinary present-day equipment. The pictures taken show culture, cover, tree age classes, brush, forest types, within reasonable limitations, reproduction and even geological formations. The pictures, Mr. Flint stated, also have a future value. They will illustrate change due to time.

Mr. Flint did the first aerial photographic mapping for the Forest Service in this region, Montana and Idaho, in 1926. Since then 4,700 pictures covering between 600 and 700 square miles, have been taken with promising results.

Great strides have been made during the last decade. The complete and successful photographing and mapping of Death Valley recently, from an altitude of 15,000 feet with maximum ground temperature of 138° F. and an air temperature of 60° F., was cited.

Aerial photographic mapping is still in its experimental stage. There is rapid development in photography and also in aeroplane mechanics. Mr. Flint predicted a great future for the art.

G. Jemison, *Reporter.*

Reforesting Machines Described

The horse and tractor-drawn reforesting machines, manufactured by the Champion Sheet Metal Company of Cortland, N. Y., are elaborately illustrated with cuts made from actual photographs in the Company's bulletin No. 3.

STRIBUTION OF SYRACUSE FORESTERS

A recent study of the alumni statistics the New York State College of For- y, Syracuse University shows that out 698 graduates who have been granted rees since the organization of the in- ution in 1912, 13 are deceased, the inesses of 28 are unknown and the ance are distributed in 44 states and foreign countries. 339 of the alumni located in New York State; 63 per t employed in New York are in for- ry work. Sixty-seven per cent of the al number of graduates are engaged in rk along lines for which they received ining at the College representing eleven ferent branches of forestry.

REST DEVELOPMENT COMPANY FORMED

Through the incorporation of the For- Development Company on May 2, un- r the laws of Delaware, the Weyer- euser lumber interests of northern aho have segregated the forest protec- n and management activities from their erating company, Potlatch Forests, Inc. e company has a capital and reserve of er $500,000, and the land holdings ex- d 175,000 acres in Clearwater, Latah, newah, Shoshone and Bonner counties. e powers of the corporation are broad d include: To promote the reforesta- n of lands; to protect and develop ds suitable for silviculture, grazing or onizing; and to engage in all kinds of nmercial, trading, agricultural, logging, nbering, manufacturing and real estate siness.

The primary purpose of the Forest De- opment Company is to segregate and organize for protection and forest management the permanent forest lands previously included in the holdings of Potlatch Forests, Inc., in northern Idaho. The company will also take over some lands of agricultural value but will dispose of these to settlers as rapidly as conditions permit. Mr. C. L. Billings who was elected president of the new company is also manager of the Clearwater unit of Potlatch Forests, Inc. He is a senior member of the Society of American Foresters.

In announcing the formation of the company Mr. Billings expressed the confidence of the stockholders "in the practicability and ultimate success of the forest management policy which we have been trying out on our Clearwater properties since operations started in 1927." He stated also that "only by this segregation of our investment in forestry can we be in a position to accurately measure and inform the public about costs." Mr. Billings' offices are in Lewiston, Idaho.

NORTHEASTERN FOREST STATION MOVED TO NEW HAVEN

Headquarters of the Northeastern Forest Experiment Station were transferred from Amherst, Mass., to New Haven, Conn., in June. Under a coöperative arrangement with Yale University, the station will occupy office and laboratory space in a building owned by the university.

Since its establishment in 1923 the station has occupied quarters at Amherst. These quarters are no longer available, and it was necessary to find a suitable location elsewhere.

British Columbia Forest Resource Data Revised[1]

Sufficient work on the inventory of forest resources has been done to justify the use of revised figures for the total stand of timber in British Columbia. It is suggested that the following figures should be used, when public reference is made to the timber of British Columbia, in place of the figures given by the Commission of Conservation in 1917.

The revised estimates, Table 1, cover all the standing timber of merchantable quality (with reference to present utilization in saw- and pulp-mills, hewn ties, etc). They do not include small trees, such as lodgepole pine, suitable chief for pulp at some time in the distan future.

The figures for the coast (includin Prince Rupert District) are based on th completed inventory of best available e timates. Figures for the remainder of th Province are founded on the Commissi of Conservation's estimates, with parti adjustments made to take care of subs quent logging, fires and revised estimat based on recent reconnaissance. The are, however, of a preliminary natu and less reliable.

Total volumes are given without r spect to accessibility. This factor h been examined for the mainland coa

Table 1

TIMBER RESOURCES OF BRITISH COLUMBIA
Revised Estimate
Volumes in Million Board Feet

Species	Vancouver Island	Vancouver Mainland	Pr. Rupert District	Rest of Interior	Total
Douglas fir	32,000	8,700	1,440	15,000	57,140
Cedar	20,800	13,600	8,270	10,000	52,670
Hemlock	27,600	7,900	15,700	7,000	58,200
Fir, silver	10,200	3,400	8,270	8,000	29,870
Spruce, Sitka	2,200	680	7,080	———	9,960
Spruce, Engelmann	———	———	5,400	40,000	45,400
Pine, white	560	160	———	1,000	1,720
Pine, yellow	———	———	———	2,000	2,000
Pine, lodgepole	———	73	3,530	10,000	13,600
Larch	———	———	———	2,000	2,000
Cypress, yellow	1,340	860	830	———	3,030
Cottonwood	———	36	350	100	490
Totals	94,700	35,410	50,870	95,100	276,080
Accessible[1]	66,000	20,000	21,500	50,000	157,500

Estimates by Forest Surveys Division, December, 1931.
[1]"Accessible" as judged by past logging during prosperous periods with highest average price these accessible figures are a rough estimate only and naturally are subject to fluctuation.

[1]In a letter to the Editor, Mr. F. D. Mulholland, Assistant Forester, writes: "You will notice th the figure of 350,000 million (the Commission's figure in 1917) has been reduced to 276,000 milli The difference is accounted for by logging, fires, and improvements upon the previous estimates standing timber. In any case it is obvious that natural increment is nowhere near the amount depletion. The great majority of natural increment is in the Interior and in the form of timber not present of merchantable value in the industry as organized here. There are very large volumes small lodgepole pine, for example, which may be of value at some time in the future. *Ed.*

TABLE 2

TIMBER RESOURCES OF BRITISH COLUMBIA
Estimates of the Commission of Conservation (1917)
(All Volumes in Million Board Feet)

Species	Vancouver Island	Vancouver Mainland	Pr. Rupert District	Rest of Interior	Total
uglas fir	43,510	18,600	1,510	12,400	76,000
dar	27,880	23,190	10,200	16,700	78,000
mlock	28,090	10,450	17,480	8,100	64,100
r, silver	11,030	4,970	8,230	8,700	32,900
ruce, Sitka	3,780	1,200	9,160	—	14,100
ruce, Engelmann	—	—	9,780	49,200	59,000
ne, white	760	320	—	1,600	2,700
ne, yellow	—	—	—	4,200	4,200
ne, lodgepole	16	19	990	10,800	11,800
rch	—	—	—	3,100	3,100
press, yellow	1,830	850	1,370	—	4,100
ttonwood	—	59	560	200	800
Totals	116,900	59,660	59,280	115,000	350,800

d Prince Rupert districts and an es-mate of accessibility based on a study of uises and reports of forest engineers vering those districts. The percentage accessible timber in the rest of the rovince has been roughly estimated from ercentages found in large areas of which rveys have been made; this is less re-able than the Coast figures. These "ac-ssible" estimates are given chiefly to in-icate that a comparatively large per-ntage of the total volume of mature mber still remaining in the Province is ot accessible as judged by present-day andards of utilization.

For purposes of comparison the Commission of Conservation's 1917 figures are given in Table 2.

FOREST SURVEYS DIVISION,
B. C. Forest Service.

ERRATA

In the March 1932 issue, the following corrections should be noted:

In Table I, page 324, of Mr. Brewster's article, the first figure in the third column, 700,000,000, should read 70,000,000; and the order of the headings of columns 4 and 5 should be reversed.

REVIEWS

Effect of Abnormal Long and Short Alternations of Light and Darkness on Growth and Development of Plants. By W. W. Garner and H. A. Allard. *Journal of Agricultural Research 42: 629-652, 1931.*

In studying the influence of time of sowing on the time of flowering in soy beans and other plants, the authors discovered that some plants require days of more than 12 hours of light for flowering, others require days of less than 12 hours of light, while a third group of plants appeared to flower regardless of the daily period of illumination. These plants are termed long-day type, short-day type, and indeterminate in flowering habit. They noticed that shortening the daily period of illumination during the middle of the day did not have the same effect on flowering as shortening the day at morning or evening.

Consequently, a series of experiments were undertaken in which the various types of plants were subjected to alternations in light and darkness which do not occur under natural conditions. Plants grown with full daylight, shortened on alternate days to 10 hours, showed predominately the effect of short days, that is, the plants flowering on short days flowered almost as usual while those requiring long days showed greatly delayed flowering. Using a 48-hour cycle of about 15 hours of light, followed by 33 hours of darkness, the short day plants again flowered, but not quite as readily as in the previous case.

Perhaps more interesting, however, are the experiments in which alternations of light and darkness of much shorter duration were used. In these experiments alternations varied from 12 hours to seconds with equal periods of light a darkness. Short day plants would flower on alternations of 1 hour, minutes, 15 minutes, 5 minutes, 1 minu 15 seconds and 5 seconds; whereas, lo day plants flowered much earlier with shorter alternations than they did un 12 hour alternations. Plants of indet minate flowering flowered about the sa time in all light periods. It is se therefore, that with short alternations light and darkness plants behave si larly to those exposed to long days

The effects on growth and gene nutrition of short alternations in li and darkness were very pronoun Alternations ranging from 30 minutes 15 seconds were unfavorable in alm every case. Some plants were unable survive with one minute light interv The leaves were small and poor chlorophyll, the stems were spindl and weak, and, in general, the pla presented the appearance of those gro in very low light intensities. Increas the light period to 1 hour and 12 ho caused a pronounced increase in grow and decreasing the interval from 15 onds to 5 seconds also caused a gr improvement in growth. The effect practically the same with both short plants and long day plants.

Using cycles in which the period darkness was twice as long as the per of light caused an intensification of unfavorable effects of the intermedi alternations so that the plants soon di Increasing the light interval to twice interval of darkness, on the other ha

tended to improve the general appearance of the plants.

These experiments were carried out with herbaceous plants, using small chambers with artificial light and artificial temperature controls. The period of light was followed by a period of complete darkness. The light was furnished by 1,000 watt lamps that gave values of 1,000 and 4,000 foot candles, which is approximately one-half the illumination of daylight.

Experiments by others have shown that photosynthesis proceeds more rapidly when plants are exposed to very rapid alternations of light and darkness than when they are exposed to the same amount of light under continuous illumination. The alternations in light and shade, occurring at any point under a forest canopy, have, therefore, been regarded by some foresters and ecologists as favorable for plant growth.

Both of these experiments were carried out under artificial conditions, which differ greatly from those encountered under forest canopies. It would seem, however, that, until more work has been carried out, the actual effect of discontinuous light in the forest must remain an open question.

HARDY L. SHIRLEY,
Lake States Forest Experiment Station.

Holz, Blattmenge und Zuwachse 1. Mitteilunge Die Weymouthsfohre. (Wood, Leaf Volume and Growth, Part I, the White Pine.) By Hans Bürger. *Mitteilungen der Schweizerischen Centralanstalt für das forstliche Versuchswesen. Vol. 15. Pp. 243-292. 1930.*

Bürger's work deals with a subject of considerable interest to American investigators of tree growth. Due to the fact that actual data on the relationship between leaf volume and growth are rare, it was felt desirable to translate the entire summary of his publication. This follows:

These investigations on the quality of the wood, the quantity of the needles, and the growth of white pine are based on a study of 24 trees obtained from eight different situations. The age of the trees varied from 21 to 70 years, their diameter from 9 to 47 cm., and their height from 10 to 34 meters. A total of 625 samples of stem wood were examined and also a suitable number of samples of branches and needles. The results obtained may be enumerated as follows:

1. The specific weight of the wood of white pine in the green state decreases in a degree as the diameter increases. The heartwood especially deviates more noticeably. It has an average: For poles up to a diameter of 20 cm., 1.0 to 0.85; for trees, from 20 to 30 cm. about 0.9 to 0.80; for trees, from 30 to 40 cm., about 0.85 to 0.75; for trees over 40 cm. in diameter, 0.80 to 0.70. The average is 0.57 for heartwood and 1.03 for sapwood.

2. The absolute specific weight of the wood of stems of the same age increases from the pith toward the periphery. The wood of young white pine is very light. In proportion to the rate of the growth of the trees the influence of the wind manifests itself by an increase of the axial compression and tension which results in an increase of the weight of the wood at the base of the tree. The heavier wood has been found not in the trees growing alone and not in trees with a more weakly developed crown, but in trees occupying an intermediate space between these two extremes. The specific gravity of the samples examined varied from 0.28 to 0.46, for the individual stems from 0.30 to 0.38, and finally for the commercial stems from .33 to .38. The average specific gravity for all of the test pieces is 0.36.

3. The sap content in per cent of the absolutely dry weight in pure heartwood amounted to 91 per cent, in sapwood 209 per cent. Comparative investigations of stems from the same site show great variations. In general, the sap content diminishes as the diameter of the stem increases. Poles contain about 220 per cent water. Stems over 40 cm. in diameter contain only about half as much. This is important in transportation.

4. The volume of the organic substance of the wood of white pine averages for all the samples studied, 21 per cent of the volume of the green wood. The extremes are 17 and 24 per cent; for entire stems mostly between 20 and 21 per cent. In larch the amount is about 30 per cent and for a beech and oak it may exceed 35 per cent.

5. The relation between solid substance, water, and air of white pine wood shows 21 per cent solid organic substance and 79 per cent pores which are filled partly with water and partly with air. In the heartwood this relation is on the average 20 per cent solid substance, 29 per cent water, and 51 per cent air volume. In the sapwood the figures differ: 21 per cent organic substance, 68 per cent water, and only 11 per cent air. These facts are worthy of notice with respect to fungus attacks in heartwood and sapwood.

6. Shrinkage of the wood volume from green to absolutely dry condition amounts on the average to about 9 per cent of the green volume, 7.5 per cent in the heartwood, and 9.8 per cent in the sapwood. The corresponding volumetric shrinkage of beech exceeds 15 per cent. The volumetric shrinkage of white pine is dependent upon the specific weight and the impregnations which take place in the formation of heartwood. This is important in the purposes for which the wood is used.

7. The formation of heartwood in white pine in the localities studied is, with re- spect to color, less intensive than in n native habitat. The number of sapw rings at the top of the merchanta length of the tree is only one-third two-thirds as many as at the base of stem. White pines, 60 to 70 years contain from 49 to 64 per cent hea wood. The cross sectional areas of rings carrying sap is very great in stems at the base of the stem, decrea quickly 2 to 5 meters above the grou then slowly up to the crown base, after that still more quickly within crown.

8. The proportion of solid wood branc and needles varies considerably with age. Up to about 50 years, the prop tion of solid wood increases as the p portion of branches diminishes. After t the proportion depends almost enti upon the development of the crown. proportion of needles by weight in green condition of the total mass is the age of 20 years, about 7 to 9 cent; at 30 years, about 4.5 to 5.5 cent; at 40 years, about 5 per cent; 50 years, about 3.5 per cent; at 60 ye about 3 per cent; and at 70 years, ab 2.5 per cent. The weight of the nee in the green condition varies from 16, to 20,000 kg. per hectare.

9. The sap content of stems, branc and needles. The sap content decre from the stems through the branches the needles. The last two are lower sap during the period of active gro than during the period of vegetative r A stand 70 years of age with a total ume of 1031 cu. meters per hectare able to accumulate 537 cu. meters water which is equivalent to a precip tion of 54 mm.

10. The number of needles and t surface area. Leaving out of considera the needles of very young plants a l

gram, green weight, contained from 50,000 to 120,000 needles. The needles have a surface area of 0.7 to 1.4 square centimeters each, 7.0 to 11.2 square meters per kilogram green weight. The smallest est stems, 9 cm. in diameter, had 190,000 needles with a surface area of 23 square meters; the rather free standing stems 41 cm. in diameter at Lenzburg possessed 6.6 million neddles with a surface area of 940 square meters. The needle surface of a stand amounts to 140,000 to 170,000 square meters per hectare, 14 to 17 times more than the ground area.

11. Relation of the growth to needle quantity. The growth of a single stem is to a certain degree proportional to the needle quantity. In order to produce a cubic meter of wood per year requires from 600 to 1,500 kilograms of green needles, an average of 1,000 to 1,100 kilograms. In order to make 100 kilograms of dry wood substance a white pine stand needs 90 to 140 kilograms of absolutely dry weight of needles. With increasing density of the needles of a tree crown the individual needles decrease their activity. On the average 1,000 to 1,100 kilograms of green needles are required to produce a solid meter of woody growth which corresponds to a transpiratory and assimilatory needle surface of about 10,000 square meters per hectare.

The preceding investigations naturally do not claim to have completely solved the problem of wood growth in relation to needle quantity in white pine. They furnish us at least, for this species, some conception of the factors in the case and permit us therefore at the same time to be able to render an approximate account of the method of production employed by the white pine. But it is necessary to guard against the desire to draw from that examination hasty conclusions on the biological aspects of white pine. It is better to await the opportunity to establish comparisons of these results with similar studies made on other species. Next year we hope to be able to add further contributions to this question.

BENSON H. PAUL,
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Improvement of Woodlands. By W. E. Hiley. *Country Life, Ltd., London. 250 pages, 1931.*

This book is a sequel to a previous publication by the same author, *Economics of Forestry*. It is an application of the results of that study, in popular form for the use of land owners, who are not foresters but who desire to utilize their woodlands to best advantage. British private forests consists almost exclusively of small holdings. Only four forest properties in England and Wales are over 5,000 acres in extent, nine are from 3,000 to 5,000 acres, 174 from 1,000 to 3,000 acres, and the remaining 1,400,000 acres are in smaller holdings. The annual increment is but one-sixth of the possible yield, averaging 14.7 cubic feet. Taxation under British laws is especially favorable to forestry due to exemptions and grants. This factor reduces the average taxes payable on woodlands, so that the burden is much lighter than in continental countries. In spite of this fact, British private forestry has not on the whole prospered, though there are examples of well managed forest estates especially in Scotland. The author advises the formation of syndicates of private owners for coöperation in the employment of technical forest managers, combined saw-milling and marketing, and coöperative use of machinery.

At present practically no private foresters are employed in Great Britain, their place being taken by woods foremen, and the direction being dependent on the interest and knowledge of the owner.

Several chapters are devoted to the characteristics of species for planting, including exotics of which Douglas fir and Sitka spruce are strongly recommended. Natural regeneration practically always involves fencing against rabbits and the cost may run as high as $50.00 per acre, but early returns are possible from conifers from the sale of mine timbers. An instructive chapter is given on thinnings in which the length of crown is cited as the best indicator of the proper time for the operation.

A most interesting chapter is contributed by Hon. N. A. Orde-Powlett on "How to Combine Sport with Forestry." The increasing importance of pheasant shooting as a source of private revenue is shown, and the character of coverts described which are necessary both for the production of birds and for shooting, which is done by driving the birds over the guns. To this writer, Sitka spruce is anathema, as the beaters get so scratched and mauled in the spruce thickets that they refuse to go through them and the birds find sanctuary which defeats the purpose of the sport. Douglas fir is not favored either as it rapidly forms a dark forest unfavorable to the sport. Larch, ash, sycamore and poplar, on the other hand, are regarded with great enthusiasm, and the advantages of a well managed normal forest with a succession of age classes of these species is described as superior to neglected woodlands.

An interesting chapter by the author treats of maintaining the beauty of woodlands by means of various practical measures.

For the American reader the value of this book lies in the clear and compreh
sive picture which it gives of forestry co
ditions in the British Isles, in the busin
like treatment of the subject of est
management, and in the sidelights on
handicaps which private forestry still s
fers, in a country well supplied with m
kets capable of absorbing small materi
and which imports 95 per cent of
wood. A lesson which can be drawn
that the extensive reforestation operati
of the British Government, necessar
omitted from this manual, offer m
promise than does private forestry
spite of tax subsidies and favorable m
kets. This condition may well apply w
equal force to America.

H. H. Chapman,
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Diameter Distribution Series in Ev aged Stands. By Walter H. Me *Yale University School of Fores Bull. No. 28, Pp. 105, Figs. 1 1930.*

Mathematicians, astronomers, biologi
and others, for the past 150 years—
more recently foresters—have been se
ing mathematical formulas for the
quency curves encountered in their
spective fields. As a result, there are
day two leading statistical schools e
advocating different frequency curve
mulas; one led by the eminent Eng
biologist and statistician, Pearson,
one by the eminent Swedish astrono
and statistician, Charlier.

In this bulletin the author presents
methods and results of fitting Charli
Type A and B frequency curve form
to the diameter distributions of trees
pure even-aged stands of Douglas fir,
spruce, northern and southern white

lar; slash, shortleaf and Ponderosa pine; and balsam fir. For each species, the variations of the shape of the frequency curves with variations of average diameter, age, site, and density are also investigated, and Charlier's mathematical methods, compared with the graphical methods used by American foresters to prepare stand tables.

The author prefers Charlier's curves for the following reasons: their relative simplicity, precedence of their use by foresters, and the fact that the curves vary in shape from those of extreme negative skewness through the normal curve to curves with positive skewness.

The Type A curve, known as the Laplacean-Charlier and Gram-Charlier curve, was derived by adding to the formula for the well-known normal curve the formulas of its higher derivatives. These derivatives make it possible to represent by the Type A formula curves that vary from the normal curve.

The Type B, or Poisson-Charlier curve, was derived from Poisson's formula for discontinuous distributions by adding to it the formulas of its successive differences. These differences make the shape of the Type B curve very flexible; and therefore representative of curves differing greatly in form from the basic curve.

The subject is discussed under the following headings: purpose and scope of study, literature, methods of study, and diameter distribution series of several coniferous species. A very good summary with conclusions is also given.

The author gives a brief synopsis of the important European and American literature, dealing with the diameter distribution of trees. In this survey of literature, the value of Fourier's series as a mensuration tool is pointed out by the author. Concerning this, he says: "The universal application of Fourier's series is certainly worth further consideration."

Under method of study, the author shows how Charlier's curves are fitted to actual data. The methods of computing the constants for each are very clearly shown by concrete examples worked out by Charlier's systematic tabular, and self-checking methods. Pearson's Chi-square test of goodness of fit for determinnig the agreement between the actual and curved data is also briefly discussed here.

Under the general topic, diameter distribution series of several coniferous species, the author presents a graph for each species showing the variation of the standard deviation and the coefficients of skewness and excess with average diameter. From these curves he draws the following conclusions:

1. The trend of each stand characteristic with diameter follows the same law in most species, and where a non-conformity exists it may be attributed to faulty material.

2. The standard deviation curve is almost a straight line with a positive slope.

3. The coefficient of skewness curve, except for one or two erratic sets of data, is concave downward and always increases from extreme negative values to values near zero.

4. The coefficient of excess curve is concave upwards, and usually starts from slightly positive values and changes to slightly negative values.

5. For the larger diameters all of the curves approach constand values.

The variation of these characteristics with age and site was found to be similar to the variation with diameter. No relationship was found between them and stand density.

Meyer points out that it is just these changes in the shape of the tree distribution curves with age, site, and diameter that the graphical methods iron out; and for this reason they may lead to serious error.

The author draws the following conclusion concerning the use in this study of Pearson's chi-square test. "This test is often too severe since it fails to take into account purely erratic conditions, such as excessive numbers of trees in one or two diameter classes . . . . The test assisted materially, however, in establishing the preference of one or another type of fit to the actual data." As the probabilities obtained by this test fall within the limits within which chi-square would fall purely as the result of chance, it is questionable whether Meyer was justified in drawing the conclusion that the Type B curve under some conditions was a better fit. These probabilities might be reversed and show that the Type A curve was a better fit if another sample taken under identical conditions as the first were analyzed.

In addition to the above, the author draws the following general conclusions.

1. "The Type A and Type B curves have their place in the description of diameter distributions. The Type B is preferable for stands of small average diameter; for slightly skewed distributions, the Type A is preferable."

2. "The practical application of this study lies in the production of harmonized stand tables for each of the species, although this investigation was not carried that far."

This bulletin is a scholarly treatment of the application of Charlier's curves to tree distributions in pure even-aged stands of conifers, and in spite of the mathematics involved is very readable. By bringing this statistical tool to the attention of American foresters in terms familiar to them, Meyer has made a worthy contribution to American forest mensuration literature. Foresters who are working with frequency curves of any kind will find this bulletin very instructive and helpful.

R. M. Brown,
University of Minnesota.

Bibliographia Universalis Silvic turae. I. Dania. Den dans Skovbrugs — Litteratur und 1925. (Universal Bibliograp of Silviculture. I Denmark.) Oppermann and V. Grundtvig. *Lee and Munksgaard, Copenhagen 19 290 pages.*

This volume of 290 pages, listing forestry literature of Denmark up 1925, is of extraordinary interest to f esters the world over, not so much account of its content as because it the first actual appearance in print o portion of an immense and notewor undertaking which has been in devel ment since 1903. In that year, at fourth meeting of the International Un of Forest Experiment Stations, Phil Flury proposed the compilation of international forestry bibliography. Si that time the matter has been repeate pressed especially in European fore circles, but progress has been greatly layed both by the war and the death many of the leaders of the project. permann of Denmark was one of the terested foresters and in 1926, as act chairman of the bibliographical com sion, he continued pressing plans for international bibliography and since t time considerable progress has been m for the general bibliography in meeti at Rome in 1926 and Stockholm in 19 At the same time without waiting complete world plans Oppermann had out on the Danish section which r appears in print.

Its publication will give the wh project great impetus, and will proba set precedents as to scope, form, method of presentation. It consists three main divisions: (1) includ papers with author's name given (4 entries), (2) anonymous and polynym

ritings (456 entries), (3) collection ritings (256 entries). The third section divided into seven subsections: (a) onferences, (b) Excursions, (c) Exhibi- ons and demonstrations, (d) Societies, xcept *periodica,* (e) Journals, (f) An- ual reports of associations, (g) Various eriodical publications. The entries are rranged alphabetically by authors, and the case of titles in other languages han English, French or German—most f them are, of course, Danish—an bridged German translation of the title given.

The bibliography contains material rinted within the frontier of present enmark, that printed by Danes abroad nd publications of foresters concerning enmark—for example Zon and Spar- awk's *Forest Resources of the World.* he field of forestry is considered very roadly and much material pertains to eneral botany, plant diseases, insects in eneral and to wood and its utilization. t is a most stimulating piece of work.

F. S. Baker,
University of California.

Wild Animals of North America. Intimate Studies of Big and Little Creatures of the Mammal Kingdom. By E. W. Nelson. *Revised new edition, pp. 254, illustrated. National Geographic Society, Washington, 1930. $4.00.*

This work, originally received with ac- laim by discerning students of nature hroughout the country, and the subject f a highly complimentary review by the ate Ex-President Roosevelt, has now ap- eared in a handsome new revised edi- ion, which is undoubtedly destined to ill an even larger place than the original dition.

In the revision much of the material, especially the introductory matter, has been rewritten. The work has been divided into fourteen chapters, to the great advantage of the student or general reader. In the first chapter the general characteristics and origin of the mammal fauna as a whole are considered, together with a particular discussion of the larger species and some of their fossil predecessors. A treatment of the smaller mammals and their ways follows in Chapter II; "The Classification of Mammals: the Opossums, the Moles and Shrews, and the Bats," Orders Marsupialia, Insectivora and Chiroptera, in Chapter III; the Order Carnivora in Chapters IV and V; the aquatic flesheaters, Order Pinnidedia, in Chapter VI; the Rodentia in Chapters VII to X; the rabbit-like animals, Order Lagomorpha, in Chapter XI; the even-toed hoof mammals, Order Artiiodactyla, in Chapters XII and XIII; and in the final Chapter XIV, the armadillos (Order Xenarthra), the sea-cows, dugongs and manatees (Order Sirenia) and the whales and whale-like animals, Order Cetacea.

The first two chapters are more or less introductory, and give something of the general world relationships of mammals. Also, in the first chapter, the relation of environment to living things, the wonders of the fossil record, the strange story of the place of origin of important groups of mammals, the early unbelievable abundance of valuable wild life, the exploitation of mammals at the hands of man, and finally the steps taken for the conservation of mammals are briefly treated. There is emphasis on sane conservation throughout the work.

In Chapter II some of the fascinating details of the adaptation of the smaller mammals to their surroundings are given. Little-known characteristics and peculiarities of these organisms, as the increase in ferocity to a certain extent in proportion to their decrease in size, are mentioned.

References to the habits and customs, the interrelationships, the nocturnal habits, the beginning intelligence, the home-life of mammals in general, cannot fail to intrigue the interest. Not that spectacular items are given undue prominence, but information, often locked in dusty reference works in the libraries, or not set down in any books at all, has here been served up in a manner and appearance that whet the appetite for more.

Chapter III begins with a brief reference to the classification of mammals, then gives significant and interesting details of the world occurrence, habits and some of the outstanding physical and mental peculiarities of the marsupials, in which the mother pumps milk to her babies; the insectivores, which contain probably the smallest mammal in the world, weighing much less than an ounce; and the bats, which are the only mammals that fly like birds, and that vary in size from the " . . . tiny butterflylike Pipistrelle, of the southwestern United States, less than an ounce in weight, to the great flying foxes of southeastern Asia, Polynesia, and the Australian region, the largest of which attain a wing-spread of about five feet." Following the general references to the orders, families, and their significant characteristics, are the accounts of individual species. These present, with admirable comprehensiveness in spite of limitations of space, an outline of the distribution and habits of the principal kinds of our North American mammals. These individual accounts take up the greater part of the book and are its most valuable portion.

At the beginning of each chapter in turn appears a concise introduction which gives the general structural, geographical and economic relationships of the groups of mammals to be immediately treated, and points out some of their distinctive and striking characteristics before proceeding to the discussion of individual species. Most of these introductory tr ments are new in this edition of wh they form a valuable feature.

Dr. Nelson's book is no mere list mammals. The author takes the rea with him to the natural haunts of subject, whether it be the polar bear the frozen north, or the tiny pocket mo of the arid wastes of Mexico. With markable insight he paints in well-cho words the salient characters and inter ing features concerning each species c sidered.

The new edition is well-suited for as a reference work or even text book mammals (the original edition has b extensively used in this way), though dislike to use text book with its conn tion of drudgery and all too often d deadness, in connection with Dr. Nels work. There is a sparkle and color to present production that should make it tractive to students as well as sportsm and out-door lovers generally.

The utility of the book to foresters range specialists is obvious. A great nu ber of the mammals considered are rel in some way or another to the forest range environments and are import either from the standpoint of game, p tection, recreation, or other valid po of view. The book might well be in ev forester's library.

Additions and emendations have b made in some of the life history accou to bring them up to date. The aut was Chief of the United States Biolog Survey over many years, and in additi to his own field work in many parts North America—from the Arctic to tropics—he has had access to the wea of material gathered into the files by field naturalists of that organization, of the foremost institutions in the wo for the study of wild life. To his own perience and to these unusual opportu ties, the merit of the work is in part

The addition of an index makes the information presented much more accessible than in the original edition.

Dr. Nelson is not only a scientist of high attainment, but he possesses unusual literary ability, which is obvious as one reads in detail the pages of his book. This quality of literary charm, in harmonious admixture with the results of wide personal field experience in the study of mammals, as well as extended knowledge of the literature, results in a production of unusual value all the way around. Add to these things the excellent illustrations, including tracks by Seton, photographs of remarkable quality by various persons, and colored paintings by Fuertes, and the unique character of the book is obvious.

Of highly technical books there are many, and of "popular" books with little scientific background, not a few, but works are scarce which combine technical accuracy and authentic experiences with attractive illustrations and interesting subject matter. Of these latter Dr. Nelson's is one of the most outstanding.

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The Measurement and Interpretation of Forest Fire-Weather in the Western Adirondacks. By Paul W. Stickel. *Technical Bulletin No. 34, New York State College of Forestry, 115 p., illus. Syracuse, N. Y.*

This excellent bulletin is based on results of comprehensive studies and experiments carried on as a coöperative project between the Northeastern Forest Experiment Station and the New York State College of Forestry. It is the first complete discussion of the various phases of the work carried on at the College of Forestry Camp at Cranberry Lake, New York, during the fire seasons of 1925 to 1929 inclusive. Results of other fire-weather studies, based on western conditions, have been published, but Stickel's work is the first to have been carried on entirely in the East. The Cranberry Lake Station was the forerunner of other similar observation stations in New York and New England used for the study of forest fire weather, but the data and conclusions presented in this bulletin are based only on the Cranberry Lake observations.

At the inauguration of this study, very little interest was shown by agencies concerned with fire prevention and suppression in New York State. The Empire State Forest Products Association however contributed funds to inaugurate the study, and their forester carefully watched the results obtained.

By the end of the first season's observations, the data proved of such interest to the New York State Department of Conservation that it requested that daily telegraphic fire-weather reports be sent to the Albany office. This was done until September, 1929, when the study was concluded. That the fire-weather data were of interest and help to the supervisor of forest fire control of the Department of Conservation was manifested when, after the close of the study, he requested the New York State Ranger School to supply him with similar data collected on the college forest near Wanakena, New York.

In the first 24 pages of the bulletin, the author describes the basis of the study and the various methods used in gathering the data. He discusses here the nature of the forest fuel found in the Adirondacks under a forest cover of hardwoods, and in an open area resulting from clear cutting. In order to ascertain the effects of forest cover on the moisture content of forest fuels, one observation point termed the "forest station" was established under a stand of beech, birch and maple, whereas the "open station" was in an area free of tree growth. Simi-

lar equipment was used at each station, and readings were taken at approximately the same time at each. Thus a close comparison could be obtained between the readings at the two stations. Readings were taken at 8:00 and 11:00 A. M., and at 2:00 and 5:00 P. M. daily, regardless of the weather.

"The degree of inflammability is largely due to the amount of moisture the forest fuels contain." The duff hygrometer developed by Gisborne was used to determine the "duff moisture content" and the variations in this moisture content caused by varying climatic conditions. By means of numerous inflammability tests, Stickel found that the moisture content of the duff ranged in general from "30 per cent or more with no inflammability, to 6 per cent or less with extreme inflammability." That 6 per cent is a highly dangerous point, was proved by an accidental fire at the forestry camp, August, 1925. This fire destroyed an "Adirondack lean-to" and, while it was in progress, each live cinder or spark from the fire, falling on the dry forest litter, started a spot fire. The fire occurred at noon and the 2:00 P. M. observation on the duff hygrometer gave a duff moisture reading of 5 per cent. Without the aid of water, carried by a bucket brigade, it would have proved extremely difficult to control this fire and confine it to a small area.

Forest fires in the Western Adirondacks have burned over thousands of acres of cut-over land, but only rarely have fires run through the virgin timber. The disastrous fire of 1908 laid waste a vast area which had been previously logged, but in one instance at least, it stopped as soon as the green or virgin timber was reached. This phenomenon is easily explained by reference to the tables and graphs given in this publication. Those factors causing a low duff moisture content such as high temperatures, high wind velocity, low relative humidity, solar radiation and high evaporation are a modified by forest cover. Thus for e ample, at 2:00 P. M. the duff moistu content of 2 per cent in the open corr sponds with 8 per cent in the forest; per cent in the open corresponds wi 34 per cent in the forest. For the rea ings at 11:00 A. M. and 5:00 P. M., t variations are even greater and the effec of the forest cover are even more pr nounced.

The relationship between meteorolog cal conditions and moisture changes forest fuels are treated in the bullet under the following headings:

1. Temperature factors.
   a—Air temperature.
   b—Duff temperature.
2. Psychrometric factors.
   a—Relative humidity.
   b—Depression of dew point.
   c—Vapor pressure.
3. Solar radiation.
4. Air pressure.
5. Wind velocity and direction.
6. Precipitation.
7. Cloud formation.
8. Evaporation.
9. Other elements.

By means of graphs, the author show how each of these factors influences th duff moisture content and hence th inflammability of the forest fuels. H also discusses the effect of forest canop on the duff moisture content and show that selection cuttings or selective loggi operations from a fire hazard standpoi at least, are more desirable than cle cutting due to the fact that the duff moi ture content is kept higher under a fore canopy.

The chapters on "Estimating and Fo casting Forest Fire Hazard" and t "Application of Fire-Weather Data Specific Fire Control Problems" sh which factors, or combination of facto may best be used in estimating and pr

licting periods of fire hazard. From statistical analyses it was determined that three factors taken jointly, would give a reasonably accurate basis for the determination of the fire hazard. These are: Evaporation per hour; hours since last measurable rain, and air temperature. With these three easily measurable quantities, and with the use of alignment charts given on pages 74, 75 and 76, the degree of inflammability or the fire hazard, can be determined for 11:00 A. M., 2:00 P. M., and 5:00 P. M. respectively. Stickel prefers the 2:00 P. M. observations as being more nearly reliable and stable than those taken at either 11:00 A M. or 5:00 P. M.

The application of fire-weather data to specific fire control problems is shown, and the author illustrates how with moderate expenditures for equipment, a ranger district may be organized so that it will be possible to recognize hazardous fire weather well in advance of the really hazardous period.

Foresters engaged in research work have often been criticized for not putting out results and instructions which are of practical use and application. Here then, is a bulletin which not only contains practical and definite instructions but also shows how they may be applied to help solve the ever present problem—Protecting the Forest from Fire.

In the appendices, instructions are given for the use of the various instruments such as the duff hygrometers, atmometers, hygrothermographs, etc., used in the course of the study. Accurate costs are given for each instrument mentioned, as well as a list of dealers handling such equipment.

Thirty-three investigators are listed in the very complete bibliography containing some 42 separate publications.

G. H. Lentz,
Southern Forest Experiment Station.

Annual Report of the Chief of the Biological Survey for the year ending June 30, 1931. By Paul G. Redington. *Pp. 63. Government Printing Office, Washington, D. C.*

The report calls up a background of 45 years in wild life research since the Biological Survey was established in 1885; first to study the food habits and the geographic distribution of birds, then quickly extended to North American mammals and to some extent to amphibians and reptiles. Later game protection and the enforcement of federal game laws became important responsibilities, together with economic investigations and the control of predators. The enforcement of the migratory bird treaty and the setting aside of large tracts for the protection of bird life under modifications of this treaty are mentioned among the important recent accomplishments of the Bureau. The report lists the principal events of the year as follows:

"Discovery of the cause of duck sickness that has been prevalent in the West, and its definite assignment to the field of bacteriology rather than of chemical (alkali) toxicity.

"Amendment of the regulations so as to reduce the kill of wild fowl by shortening the season 15 days (later cutting it to one month), closing specified areas to goose hunting, including brants in the goose bag limit, limiting the number of live goose decoys at a stand, and prohibiting mourning dove shooting over baited fields.

"Completion of examination and valuation surveys of 1,796,158 acres of land, recommended as suitable for migratory bird refuges, and four additional purchases of areas recommended by the Bureau for acquisition as refuges.

"Reintroducing musk oxen into Alaska by successfully transplanting a herd of 34 from Greenland.

"Beginning a coöperative study of the muskrat of the Eastern Shore of Maryland, to develop information regarding this valuable fur bearer under natural and controlled conditions.

"Congressional approval of the so-called 10-year program of predatory-animal and rodent control, and authorization of appropriations therefore not to exceed $1,000,000 annually.

"Establishment of regional plan of supervision in predatory-animal and rodent control.

"Creation of a new unit in the Bureau to consolidate the wild-life disease investigations formerly handled in separate divisions.

"Institution in Virginia of a coöperative study of diseases of upland game birds."

The report recites the special attention that the Bureau is giving through its research activities to the investigations of the habits and relations of wild life particularly as to injurious species, the relations of birds, mammals and other vertebrates to forest production, the study of specialized game situations like the Kaibab deer and the Yellowstone herd, ecological studies of mammals in coöperation with the Forest Service and the universities of Arizona and New Mexico a other specialized studies in various pa of the country. There are interest chapters and figures on the Bureau's wo with different species of predators and the control of injurious rodents of diff ent kinds; also the control of anim borne diseases of man—rabies, bubo plague and brill's disease. The last is form of typhoid fever which rats are s pected of carrying. Various refuges a game preserves are quite fully describ Discussions on the importation of su mammals as foxes, bears and monk come in for a share of space in the port, as well as game and cage birds w special reference to parrots and canar

The Bureau's long series of publi tions on state and federal game laws a federal and state fur laws, also econo bulletins in the interests of farmers a stockmen are given special mention.

The report offers to the general pub and to various game departments a wild life organizations an opportunity get an interesting picture and understa ing of the Bureau's important work w our wild life resource in its varied re tions.

John H. Hatton
U. S. Forest Service, Denver, Colo

SOCIETY AFFAIRS

Doings of the Executive Secretary

Attended the annual meeting of the American Forestry Association at Baltimore, Md., May 26 and 27. On July 29 and 30, attended the summer meeting of the Allegheny Section at Warren, Pa., September 1 and 2, attended the summer meeting of the New York Section at Warrensburgh, N. Y. In connection with these meetings and in between times have found opportunity to make personal contact with members of the Council and section officers and to discuss with them various phases of Society business.

One of the important problems, this summer, that has been absorbing the attention of the Executive Secretary and the President, is that of finances for the fiscal year 1933. The strict budgeting of accounts for 1932, accompanied by marked economies in running expenses, as well as marked increase in miscellaneous income, which offset the loss in annual dues, is making it possible for the Society to get through the present fiscal year ending November 30, 1932, without going into the "red" and without curtailing on any Society activities, and without reducing in any respect the size and quality of the Journal. What the coming year will bring forth, is as yet on the "knees of the gods." By the end of March, 1933, the special fund for the Executive Secretary will have been exhausted. What to do about it is now under consideration by the President and the Council who, no doubt, will have announcements to make in the November Journal.

The following letter was recently sent to chairmen and secretaries of all sections.

"I have before me a list of some seventy-seven members of the Society whom the all too familiar business depression has thrown out of employment and who are in the market for new positions. Probably, if all members thus situated would report, my list would run up to over one hundred.

"For each one of these seventy-seven men I have a complete record of his training, experience, previous connections, references, and that branch of forestry work for which he is best qualified.

"All I need is a corresponding list of prospective employers. On my field trips and otherwise, I have attempted to build up such a list, but, as you might expect, with little success. Obviously the present demand for trained foresters is far less than the supply.

"And yet the Society unquestionably owes it to every one of its members, who through no fault of his own has lost out in the economic upset, to exhaust every possible means of helping him re-establish himself.

"There is need for a more comprehensive and more thorough canvass of the field of opportunity than the Executive Secretary, single-handed, is able to make. If, and when, you discover any openings which a trained forester could fill (and it does not necessarily have to be a forestry job) can you not report them immediately to this office, so that I in turn can send you from my list the names of those men whom we could recommend for the position?

"Surely, in these parlous times, we shall not go far wrong, if we attempt to help first the members of our own profession, and of our own Society."

Franklin W. Reed,
Executive Secretary.

The Banker's Opportunity to Promote Stability in the Forest Industries

Please refer to President Granger's letter of April 8th, to the Director of the Reconstruction Finance Corporation, which appeared in the May Journal, pages 650-651. This letter has since been revised into a general statement, with the same title as the above heading, for use in getting over to the banking fraternity at large, the need for a more modern and an economically sounder point of view toward forest investments and loans to forest industry. The leaven is working slowly but surely.

Effort is now being made to obtain a place for Mr. Granger's paper on the program of the annual meeting of the American Bankers Association in Los Angeles the first part of October, and of the Investment Bankers Association, the latter part of the month at White Sulphur Springs, W. Va. When that is accomplished, we can then go ahead in a more aggressive fashion with the promulgation of the proposition. This will involve, no doubt, patient and persistent effort through personal contact where opportunity affords with leading bankers in various parts of the country who are interested in the financing of forest investments and operations. Progress in getting these ideas over will, it is to be hoped, be accompanied by increased demand for the services of trained foresters on the part of the banking interests concerned.

Franklin W. Reed,
Executive Secretary.

California Invites You

California will be the scene of the 1932 Annual Meeting of the Society of American Foresters, December 12 to 18. Here is an opportunity for you to gratify that desire you have long had to see the Sequoias, Sierra Nevada, San Francisco with its Golden Gate Park and Chinatown, southern California and its orange groves and "chaparral forests" and that most noted of cites, *el pueblo* Los Angeles.

Combined with all these attractions, our hosts, the California Section, promise many interesting papers and spirited discussions on the most important forestry problems of the day. Industry, with changing world conditions, has revamped its business methods and viewpoint—but how about the forestry profession? Many of the "idols" we have set up in high places have fallen in the dust; many of the panaceas proposed for ailing forestry problems have proved a failure. Is it not high time for foresters to gird themselves anew, seek fresh trails and inspiration and step forward at a livelier pace that will again bring them to the head of the procession? Some say "Yes," others say "No." Come to the San Francisco meeting and join with the leaders of the profession in telling us the answer.

The first two days of the annual conference, December 12-13, will be given over to meetings of the Council, thus allowing time for the visiting members to make trips into the redwood and Sierra regions. The general Society meetings, with papers and discussions, will be held December 14-15, followed by one day, December 16, set apart for Society affairs. The last two days of the week, December 17-18, will be spent on field trips in southern California out of Los Angeles. The annual banquet will be held in San Francisco. Entertainment and trips will also be provided for the ladies who accompany visiting members, so give your wife a treat and bring her with you—she might like to see California, too.

Annual Meeting Headquarters

The Bellevue Hotel has been selected as official headquarters for the Society's annual meeting. The rates offered are as follows: Single room $2.50, double room $3.00, double room with twin beds $3.50—all with bath. Three can use a suite of two rooms with bath at the rate of $2.00 each.

Transportation to Annual Meeting

Our members will soon be making their travel plans to attend the annual meeting at San Francisco, December 12th to 18th, 1932.

For their accommodation and that of accompanying families and friends, the Santa Fe Railway has arranged to provide special sleepers from Chicago over its own rails through to San Francisco.

For convenience of members desiring to visit Grand Canyon of Arizona enroute, one or more standard Pullman sleepers will leave Chicago on the *Grand Canyon Limited* 10.45 P. M. Friday, December 9th, arriving San Francisco 8.40 P. M. Tuesday, December 13th.

For those wishing to do directly through without stopover, one or more sleepers will leave Chicago on the *California Limited* 9.05 P. M. Saturday, December 10th, arriving San Francisco 8.40 P. M. Tuesday, the 13th.

If preferred *Los Angeles may be visited enroute* to San Francisco without additional rail or Pullman fare, using above trains arriving Los Angeles 11.30 A. M. Tuesday, December 13th if Grand Canyon is visited, or at 8.15 A. M. Tuesday if *California Limited* is used. In either case leave Los Angeles Tuesday evening to reach San Francisco Wednesday morning, December 14th, when main sessions of the meeting will begin.

For convenience of members desiring to return directly home following the field trips out of Los Angeles on December 17th and 18th, a special sleeper will be operated from Los Angeles on the *California Limited* 6.15 P. M. December 18th, arriving Chicago 9.30 A. M. on the 21st.

The Santa Fe traverses a most interesting region affording many magnificent views from the car-window, which in combination with the balmy Winter climate insures a long-to-be-remembered journey.

It is the only line with its own rails from Chicago to San Francisco and Los Angeles, providing uniform service throughout, as well as the renowned Fred Harvey meal service.

The Santa Fe's announcement of special cars will be found on the second cover of this issue.

Hawley Succeeds Bates on Editorial Staff

Mr. Carlos G. Bates who has served the Journal for a number of years as associate editor in charge of dendrology, silvics and silviculture has resigned due to pressure of official duties. He will be succeeded by Professor Ralph C. Hawley, Professor of Forestry, Yale School of Forestry.

International Union of Forest Research Organizations

Dr. C. F. Korstian, Director of the Forest School at Duke University, and a member of the Council, and Mr. Barrington Moore at present residing in England, have accepted appointment by President Granger, to represent the Society of American Foresters at the meeting of the International Union of Forest Research Organizations, September 4-11, 1932, Nancy, France.

Schlich Memorial Fund

The trustees of this fund have recently donated a portion of its income to the Society of American Foresters, to be used in whatever way the Society may see fit in the advancement of forestry. The sum given is approximately $275.00. How to use the money is now under consideration by the Council. The Schlich Memorial Fund, it will be remembered, is a trust fund, created several years ago by voluntary contributions by foresters and forestry organizations in all English speaking countries of the world, in commemoration of Dr. William Schlich and his work, in connection with the forest service in India and later in the development of forestry education in England. The annual income of the fund is apportioned in rotation to the leading forestry organizations of the countries concerned.

Joint Session Physiologists, Foresters, Ecologists

The American Society of Plant Physiologists has invited all interested members of the Society of American Foresters and the Ecological Society of America to participate with them in a joint session devoted to the physiology of forest trees. Such a meeting is in furtherance of the idea that physiology is a science which can and should be of service to all of the applied sciences dealing with plants. Foresters, keeping in mind the increased usefulness of plant physiologists in helping to solve the problems of agronomy and horticulture, will recall many difficulties in their own work which may be cleared up through the help of plant physiology.

This session will be held Friday afternoon, December 30, 1932, at Atlantic City in connection with the meetings of the A. A. A. S. The exact time and place will appear later in the programs of the Societies concerned. The session will made up of short papers devoted to som phase of the physiology of forest tre and such forest ecological papers as ha a physiological trend. Titles of pape to be presented before this session accom panied by a short abstract and inform tion as to time required and faciliti needed should be sent in ample time the secretary of the Society of Americ Plant Physiologists, Dr. W. A. Gardne Auburn, Alabama, or to the undersigne A number of foresters are coöperati with the undersigned in the furtheran of this joint session.

Friday morning, December 30, the Ec logical Society of America will conduct symposium on "Some Aspects of Fore Succession" in which such factors as h mus, moisture, light, and fire will considered by various speakers.

Raymond Kienholz,
Conn. Agric. Exp. Station.

Appreciation of Society's Cooperati

June 20, 1932.

To the President of the Society of Ame can Foresters:

Dear Mr. Granger:

The Timber Conservation Board at meeting on June 8, 1932, requested me express its appreciation of your genero offer of coöperation with the Board.

May I also take this opportunity to a my own expression of gratitude for t effective labors of Mr. Paul G. Redingt Secretary of the Society, in presidi over the last meeting of the Adviso Council and in directing the work of t Special Committee.

Yours sincerely,
R. P. Lamont,
Secretary of Commerce.

Frederick Haynes Newell
1862-1932

The death of Frederick Haynes Newell in Washington on July 5, 1932, marks the passing of a pioneer in conservation. He was elected an Associate Member of the Society in 1900 and an Honorary Member in 1914.

Mr. Newell was born in Bradford, Pennsylvania, March 5, 1862. He graduated from the Massachusetts Institute of Technology with the degree of Bachelor in the Science of Mining Engineering in 1885. He then engaged in mining in Colorado and later in engineering work in Ohio, Pennsylvania, and Virginia.

In 1888 he joined the staff of the United States Geological Survey, where he became Chief Hydrographer, and was the first aid designated under Major Powell to investigate irrigation reclamation possibilities of the arid west.

In 1902 he was made Chief of the Reclamation Service which had been established through the efforts of the late Senator Newlands and himself.

He was one of the founders and was the first Secretary of the National Geographic Society, and one of the early secretaries of the American Forestry Association. He had much to do in organizing the American Association of Engineers, was its President in 1919, and built up its membership from 4,000 to 16,000.

The following Washington note is of interest: "In 1901 F. H. Newell, of the Geological Survey, who had for ten years conducted remarkable and useful investigations in the West in company with Gifford Pinchot, called upon President-elect Roosevelt. Pinchot and Newell put before Roosevelt a program of national forestry and irrigation. Roosevelt approved their plan and told them to prepare for his first annual message to Congress a statement embodying it."

In the eighties Mr. Newell was one of a small but aggressive group of persons whose courage, vision, zeal, and intelligence carried out an ever-widening program.

This writer well remembers the active aid rendered by Newell and Henry Gannett at the National Irrigation Congress in Lincoln, Nebraska, in 1897. The writer's object in attending this Congress as a delegate from Montana, was to present a resolution requesting the reservation of every available acre of unappropriated public timber land. There was much opposition at that time in the West to timber reserves. Only after five hours of heated debate was the resolution passed by the Committee and then by the Congress. This was the first resolution of this character passed by an Irrigation Congress. Subsequent Congresses carried on the work. In 1898 the Irrigation Congress recommended, in addition to withdrawal of public forests, a businesslike supervision and appropriation for a Forestry Bureau in the Department of the Interior.

In 1915, Mr. Newell resigned from the government service and became head of the Department of Engineering in the University of Illinois. He remained there five years. In 1923, he returned to Washington and established the Research Service. His activities also carried him to Puerto Rico and Hawaii. Mr. Newell was the author of a number of works on irrigation, water power, and other subjects.

After forty odd years of active service, Mr. Newell left a record of accomplishment in the development of our natural resources of which his family and friends may well be proud.

George P. Ahern,
Washington, D. C.

PERSONALS

C. M. Granger was awarded an honorary degree of Doctor of Forestry by Michigan State, East Lansing, Michigan.

Clyde Leavitt, for many years in forestry work in Canada, will serve as technical adviser on a temporary assignment at the New York State College of Forestry at Syracuse for the current school year. He will make a study as an outside forester of such special activities of the College as extension work, research, etc.

W. C. McCormick has been appointed executive secretary of the Florida Forestry Association. He was formerly with the American Forestry Association.

John D. Guthrie has been awarded an honorary degree of Master of Science by Union College, Schenectady, N. Y.

Herbert N. Wheeler has received an honorary degree of Master of Science from Milton College, Janesville, Wisconsin.

S. R. Black, secretary of the California Forest Protection Association, has been appointed to the California State Board of Forestry, by Governor James Rolph, Jr. In July he was elected chairman.

I. T. Bode, Iowa Extension Forester since 1925, has resigned his position with the Iowa State College of Agriculture to accept the position as executive secretary for the Iowa Fish and Game Commission. In his new position, Mr. Bode will direct the program of conservation being worked out for the State of Iowa.

Richard R. Fenska, formerly professor of forest engineering in the New York State College of Forestry, is now district manager for the F. A. Bartlett Tree Expert Co. at Northampton, Mass.

Dean Hugh P. Baker has been ap- pointed a member of a committee organ- ized by the Association for the Protectio of the Adirondacks in connection wit promoting a public protest against th Recreational Amendment to the Constitu tion of the State of New York which pr vides for cutting timber on the forest pre serve lands to make clearings for enter tainment structures and which will com up for ratification by the people next fal

Canadian Society Honors Ellwood Wilson

This Scroll of Recognition is presente by the Canadian Society of Forest Engi neers as a token of deep appreciation t Ellwood Wilson, B.A., B.Sc., for his in creasing labour during the past twenty seven years in promoting the ideals an applications of forestry in Canada as charter member, former president, and a various periods, member of the Executiv Committee of the Society; as an instigato and practical demonstrator of extensive re forestation by planting; as the initiator an promoter of the use of the airplane in for estry work; as the originator and first or ganizer of coöperative forest fire protec tion in Quebec; as an eloquent and con vincing advocate of forestry on the plat form and in the press; and as a friend an counsellor of young foresters.

In acknowledgment of these and of man other services to forestry in Canada, th President and Secretary of the Canadia Society of Forest Engineers as directed b a unanimous vote at the 24th annua meeting of the Society held in Montrea on the 26th day of January, 1932, hav affixed their names.

F. B. Caverhill,
President.

A. H. Richardson,
Secretary.

Summer Meeting of the New York Section

The summer meeting of the New York Section was held on the Pack Demonstration Forest September 1 and 2. About sixty members and guests were present.

Chairman H. P. Baker opened the meeting in the evening at the Headquarters Building of the Forest, and read greetings from Gov. Roosevelt, Lieut. Gov. Lehman, Conservation Commissioner Morgenthau, President Granger and Captain Pack. Mr. F. W. Reed told about his doings as executive secretary of the Society, and about the problems the Society is facing. Chairman Baker, Mr. W. G. Howard, New York State Conservation Commissioner, and Professor R. S. Hosmer, Cornell, emphasized the excellent work of the executive secretary, and recommended the continuation of a paid secretary. On the motion of Professor Recknagel, Cornell, the following resolution was unanimously adopted: *The New York State Section at its summer meeting strongly recommends the continuation of a paid executive secretary and urges the Society's Council to devise such ways and means to that end as it deems most expedient.*

Mr. Howard told what the New York State Conservation Department has done in order to help the unemployment situation, and outlined several forestry projects the department was ready to undertake if the necessary money were made available. Mr. R. N. Hick, district forester, Conservation Department, spoke about the unemployment relief work which in the past summer has been accomplished in Oneonta County. Before the meeting adjourned Chairman Baker reported that the Section had recorded itself as against the Porter-Brereton "Recreational Amendment," passed by the New York legislature of 1930 and 1931.

September 2 was spent on the Pack Demonstration Forest, which is the gift from Mr. Charles Lathrop Pack, and operated by the New York State College of Forestry. Mr. C. H. Foster, Director of the Forest, acted as guide for the major part of the day. New developments in nursery practice, including root pruning of two and three year seedlings, inspections of the magnificent old growth pine and hemlock, a new electric sawmill layout, and experiments in slash disposal and thinning of old field white pine took the forenoon. After a basket lunch at the student camp, the group went over reproduction cuttings in white pine, machine planting, erosion control, experimental plantings, and before the meeting adjourned in the late afternoon Dr. Hirt, of the College of Forestry, told about the blister rust investigations he is conducting on the Forest for the Bureau of Plant Industry.

S. O. Heiberg,
Acting Secretary.

Elections to Membership

The following men have been elected to the grade of membership indicated.

ALLEGHENY SECTION

Junior Membership

Cordts, Frank R.
Falconer, Joseph G.
Hillgartuer, Gordon G.
Knull, Josef N.
McWilliams, James P.
Nace, William W.
Smack, Lawrence C.
Sterns, Joseph Langdon, Jr.
Stone, Leon H.
Wriston, Emory Nelson
Ziebarth, Kurt
Zimmerman, A. H.

CALIFORNIA SECTION

Junior Membership

Bachman, Earl E.
Bramhall, Albert W.
Brenneis, Andrew G.
Brokenshire, W. J.
Burkett, Luther B.
Denton, Walter B.
Fox, G. K.
Furniss, Livingston
Hook, Percy D.
Hormay, August Ludwig
Ilch, David M.
Jones, T. J.
King, George E.
Land, F. A.
Lewis, Anselmo
McCaslin, Frank

Meggers, Frank W.
Meyer, Leo W.
Merrill, Harry R.
Nelson, William E.
Parsons, Bert E.
Percey, Leslie S.
Priddle, John Frederick
Robe, H. O.
Root, George A.
Snider, Hobart I.
Struble, H. P.
Taylor, George R.

Senior Membership

Dudley, Ernest Griswold
Sanford, Burnett
Turner, Spence D.
Weber, Arnold N.
Wright, Ernest

CENTRAL ROCKY MOUNTAIN SECTION

Junior Membership

Sweeney, M. J.

Senior Membership

Webber, Marion J.

GULF STATES SECTION

Junior Membership

Adams, William P.
Balthis, Russell F.
Faulks, Edward B.
Garrison, Paul M.
Huberman, Morris A.
Lehrbas, Mark M.
Risch, Lucius J., Jr.

Senior Membership

Winters, Robert Kirby

MINNESOTA SECTION

Junior Membership

LeBarron, Russel K.

Senior Membership

Horning, W. H.

NEW ENGLAND SECTION

Junior Membership

Barney, Philip Cushman
Breckenridge, Clarence G.
Burr, Maurice H.
Cherry, Charles
Curtiss, Richmond H.
Hebb, Harold C.
Hyde, Gerald Randolph
Kienholz, A. Raymond
Walker, Carl E.

Senior Membership

Faulkner, George A.
Gruhn, George H.
Holdsworth, Robert P.
Merrill, Julian H.
Schreeder, W. Foster
Wheeler, Gerald S.

NEW YORK SECTION

Junior Membership

Arnold, Fred H.
Caulkins, John C.
Coombs, George Martin
Flynn, Horace F.
Fortin, John Broughton
Greenhouse, Samuel
Gustin, Harold Erford
Haischer, Carl E.
Hopp, Henry
Humphrey, Merwin W.
McCasland, Herbert J.
Pond, James Dunbar
Thieme, Herman L., III
Wilm, Harold Gridley
Woodford, Albert J.

Senior Membership

Bedard, Paul William

Associate Membership

Roosevelt, Franklin D.

NORTHERN ROCKY MOUNTAIN SECTION

Junior Membership

Austin, Albert C.
Baird, J. S.
Byers, C. R.
Crocker, Clayton S.
Ferguson, R. S.
Garin, George I.
Hanson, Nathaniel B.
Hartson, Harley H.
Henrichs, Ed.
Jemison, George M.
Johnson, Fred I.
Nyce, George M.
Patrie, Carthon R.
Robertson, Melvin L.

NORTH PACIFIC SECTION

Junior Membership

Bedard, W. D.
Fischer, George A.
Grogan, William W.

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Auten, John Thomas
Bay, Helmuth
Bird, Ronald L.
Brandner, H. Phil
Chapman, A. G.
Craig, Johnston Clyde
Drohomer, Michael J.
Grant, Ralph M.
Hermel, Louis C.
Hickox, Dan W.
Ineson, Frank Avery
Jobbett, Clayton C.
Meier, John Louis, Jr.
O'Neil, Russell Hugh
Smith, Lawrence W.
Sowash, Robert O.
Wernham, John O.

Senior Membership

Geltz, Charles G.
Locke, Stanley S.
McKinley, T. W.
Shaw, T. E.
Den Uyl, Daniel

OZARK SECTION

Junior Membership

Addison, William Florien
Cox, Guy

Senior Membership

Gillett, Charles Alton

SOUTHEASTERN SECTION

Junior Membership

David, William Paul
Kuehn, Charles Chacey

Senior Membership

Harper, Verne Lester
Lufburrow, B. M.

WASHINGTON SECTION

Junior Membership

Beattie, R. Kent
Janzen, Daniel H.
Kylie, H. R.

Senior Membership

Gross, Lawrence S.

Associate Membership

Scattergood, J. Henry
Leavitt, Scott

Announcement of Candidates for Membership

The following names of candidates for membership are referred to Junior Members, Senior Members and Fellows for comment or protest. The list includes all nominations received since the publication of the list in the May Journal, without question as to eligibility; the names have not been passed upon by the Council. Important information regarding the qualifications of any candidate, which will enable the Council to take final action with a knowledge of essential facts, should be submitted to the undersigned before November 1st, 1932. Statements on different men should be submitted on different sheets. Communications relating to candidates are considered by the Council as strictly confidential.

FOR ELECTION TO GRADE OF JUNIOR MEMBERSHIP

Name and Education	*Title and Address*	*Proposed by*
Adams, Alton N. Y. State, B. S., '31.	Assistant Forester, Clark Estate, Cooperstown, N. Y.	New York Section
Augustine, William B. U. of Calif., B. S. F., '30.	Lookout Fireman, U. S. Forest Service, Lake Tahoe, Calif.	A. W. Sampson, H. E. Malmsten, E. Fritz
Ball, James Curtis U. of Calif., B. S. F., '31.	U. S. Forest Service, Sequoia N. F., California Hot Springs, Calif.	A. W. Sampson, H. E. Malmsten, E. Fritz
Cleveland, Grady G. Marion Military Institute.	Chief of Field Service, Ala. State Commission of Forestry, Centerville, Ala.	Southeastern Section
Griswold, Gerald Hugh Iowa State, B. S. F., '31.	Junior Forester, U. S. Forest Service, Ouachita N. F., Hot Springs National Park, Ark.	Ozark Section
Johannsen, Paul L. U. of Calif., B. S. F., '31.	Field Assistant, Calif. Forest Exp. Sta., Berkeley, Calif.	A. W. Sampson, H. E. Malmsten, E. Fritz
Maguire, W. P. U. of Calif, B. S. F., '30. 6 months post graduate work in forestry.	Junior Range Examiner, U. S. I. S., Southern Navajo Indian Reservation, Ft. Defiance, Ariz.	Southwestern Section
Nutting, Albert D. U. of Maine, B. S. F., '27.	Forestry Specialist Univ. of Maine, Orono, Me.	New England Section
Orr, Thomas J., Jr. U. of Calif., B. S. F., '28.	Jr. Scientific Aid, U. S. Forest Service, Calif. Forest Exp. Sta., Berkeley, Calif.	California Section
Pearce, Irving Franklin U. of Calif., B. S. F., '31.	Technical Assistant, Dept. of Forestry, U. of California, Berkeley, Calif.	A. W. Sampson, H. E. Malmsten, E. Fritz
Rasor, Frank W. Colo. College, B. S. F., '26.	Dist. Ranger, Ouachita N. F., Oden, Ark.	Ozark Section
Rhoads, Judson Melvin U. of Calif., B. S., '31.	Park Ranger, Lassen Volcanic Nat'l. Park, Mineral, Calif.	A. W. Sampson, H. E. Malmsten, E. Fritz
Smalley, Francis E. U. of Maine, B. S. F., '31.	District Forester in charge of Blister Rust Control, Morrisville, Vt.	New England Section
Tallmon, Willard Burton U. of Calif, B. S. F., '30.	Registrar, Shasta N. F., Berkeley, Calif.	A. W. Sampson, H. E. Malmsten, E. Fritz
Wallace, William G. U. of Ga., B. S. F., '30.	District Forester, Div. of Forestry, Columbus, Ga.	Southeastern Section

FOR ELECTION TO GRADE OF SENIOR MEMBERSHIP

Name and Education	*Title and Address*	*Proposed by*
Bond, Willard F. Bates College, B. S., '21; Yale, M. F., '24. (Junior Member, 1925.)	Southwestern Forest and Range Exp. Sta., Tucson, Ariz.	Southwestern Section
Connell, A. B. U. of Toronto, B. S. F., '14; Yale, M. F., '22. (Junior Member, 1929.)	District Forester, Ontario Forestry Branch, Sioux Lookout, Ontario, Can.	New York Section
Corson, Carlisle W. Northern Ill. State Teachers Coll.; U. of Minn., B. S. F., '26; M. S. F., '27. (Junior Member, 1927.)	Chief Planting Officer, U. S. Forest Service, Susanville, Calif.	California Section

Name and Education	*Title and Address*	*Proposed by*
Douthitt, Fred D. U. of Nebraska, Forestry, '10-'12. (Junior Member, 1919.)	Forest Supervisor, Klamath N. F., Yreka, Calif.	California Section
Dutton, Walt L. Oregon State, B. S. F., '13. (Junior Member, 1928.)	Asst. Chief, Range Management, U. S. F. S., Portland, Oregon.	North Pacific Section
Edmonds, Marc W. U. of Calif., B. S. F., '23. (Junior Member, 1924.)	Asst. Forester, Lassen N. F., Susanville, Calif.	California Section
Elliott, Joseph E. Grammar School; Short Course Der Neillian Engineering School. (Junior Member, 1925.)	Forest Supervisor, San Bernardino N. F., San Bernardino, Calif.	California Section
Faull, Joseph H. U. of Toronto, B. A. '01; Harvard Ph.D., '04; Munich, '10, Forest Pathology. (Junior Member, 1929.)	Professor, Forest Pathology, Harvard U., Jamaica Plain, Mass.	New England Sectio
Goulden, J. J. Penn State, B. S. F., '28. (Junior Member, 1930.)	Asst. State Forester in charge of Fire Control, Florida Forest Service, Tallahassee, Fla.	Southeastern Section
Hanson, Percy D. U. of Calif., B. S. F., '25. (Junior Member, 1926.)	Asst. Forest Supervisor, Lassen N. F., Susanville, Calif.	California Section
Kevin, Paul R. U. of Wis., '16-'17; U. of Mich., B. S. F., '24. (Junior Member, 1926.)	Senior Technical Officer, Plumas N. F., Quincy, Calif.	California Section
Moore, W. H. Penn State, B. S. F., '23. (Junior Member, 1930.)	Secretary-Treasurer, Forest Managers, Inc., Jacksonville, Fla.	Southeastern Section
Nelson, DeWitt Iowa State, B. S. F., '25. (Junior Member, 1926.)	Assistant Forest Supervisor, Shasta N. F., Mt. Shasta City, Calif	California Section
Oettmeier, W. M. Penn State, B. S. F., '26. (Junior Member, 1929.)	Chief Forester, Superior Pine Products Company, Fargo, Ga.	Southeastern Section
Parker, S. E. N. Y. State, B. S. F., '22. (Junior Member 1927.)	District Forester, Connecticut. Forestry Dept., Torrington, Conn.	New England Section
Rand, Ernest A. U. of Maine (3 yrs.). (Junior Member, 1923.)	Pulpwood Contractor and Forest Engineer, Cumberland Center, Me.	New England Section
Rider, W. B. Presbyterian Academy, Pendleton, Oregon. (Junior Member, 1923.)	Deputy State Forester, Sacramento, Calif.	California Section
Rupp, George F. Penn State, B. S. F., '21; Yale, M. F., '26. (Junior Member, 1923.)	Professor of Forestry and Engineering, Univ. of the South, Sewanee, Tenn.	Appalachian Section
Sebring, Harold M. Penn State, B. S. F., '25. (Junior Member, 1926.)	District Forester, Ga. Forest Service, Macon, Ga.	Southeastern Section
Shaw, A. C. Cornell Univ., B. S. F., '19. (Junior Member, 1921.)	Forest Supervisor, Ouachita N. F., Hot Springs, Ark.	Ozark Section
Sulit, Carlos U. of Philippines, Forest School; Yale, M. F. (cum laude), '25. (Junior Member, 1927.)	Chief, Div. of Forest Investigation, Bureau of Forestry, Agricultural College, Laguna, P. I.	Arthur F. Fischer, H. H. Chapman, R. Bryant

FOR ELECTION TO GRADE OF CORRESPONDING MEMBERSHIP

Neethling, Ernest J. U. of Capetown, B. A., '17; Yale, M. F. (cum laude), '23.	Professor of Forestry, University of Stallanbosch, Stallanbosch, C. P., South Africa.	R. C. Bryant, R. Hawley, Samuel J. Re ord, H. H. Chapman

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Member of Council in Charge of Admissions.

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